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ABSTRACT

As part of a national project conducted for the National Highway Traffic Safety Administration, U.S. Department of Transportation, The Center for Vocational and Technical Education conducted a nationwide search for curriculum materials related to highway safety occupations. These materials were then screened and synthesized to provide training materials used in the project entitled "Expansion of Vocational-Technical School Programs to Accommodate Highway Safety Manpower Requirements." This program guide is a further synthesis of these curriculum and resource materials. It is intended to provide an overview of sub-baccalaureate career opportunities and related training materials in areas related to highway safety. It should be especially useful as a resource document to vocational education administrators, teacher educators, and state agency personnel responsible for planning and developing vocational and technical programs in highway safety. Special attention is given to topics such as: (1) Emergency Medical Technician--Ambulance, (2) Motor Vehicle Inspector, (3) Breath Examiner Specialist, (4) School Bus Driver, (5) Traffic Patrolman, and (6) Manpower Needs in Supportive Highway Safety Occupations. (Author/JS)

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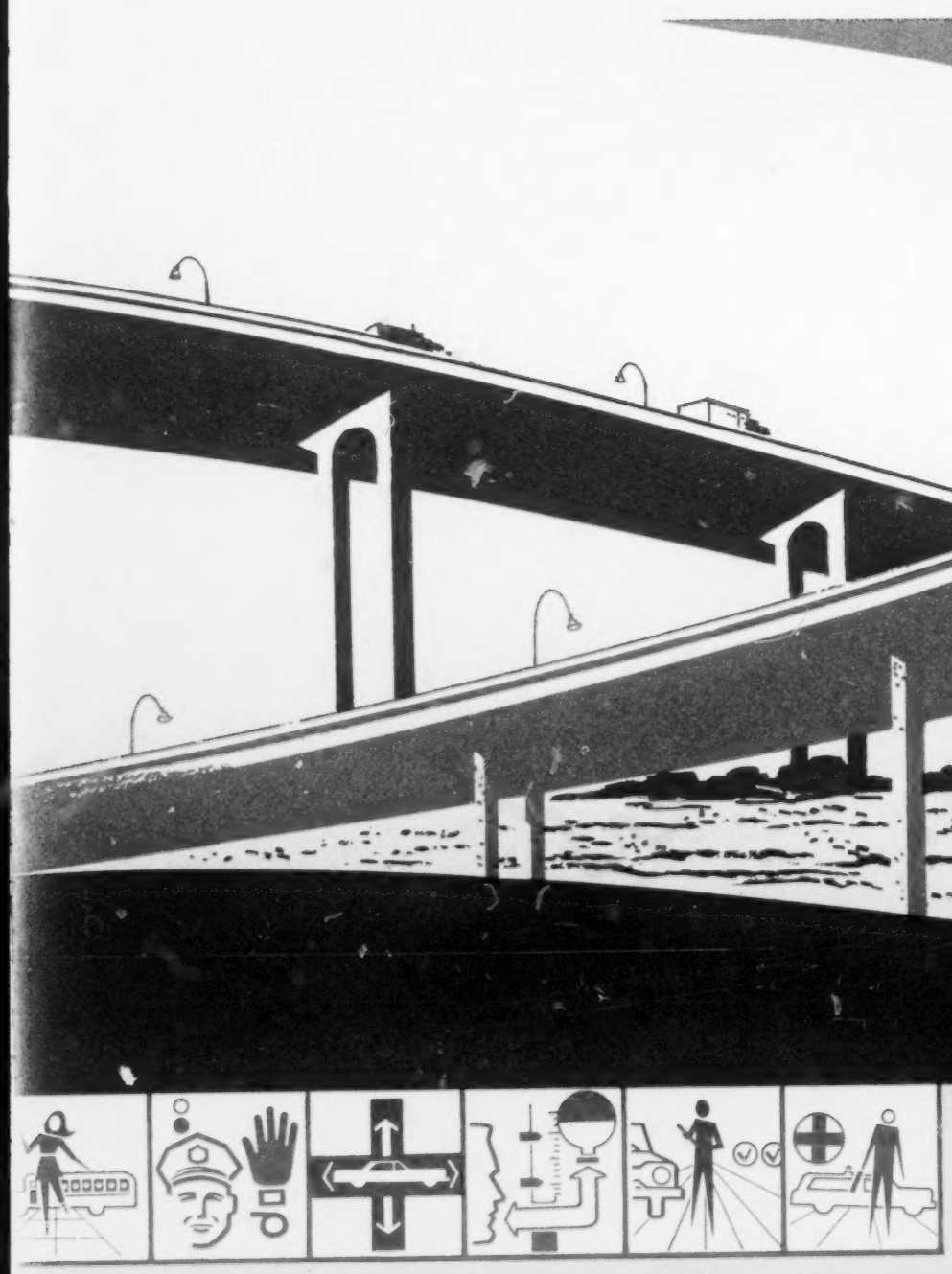

HIGHWAY SAFETY OCCUPATIONAL PROGRAM DEVELOPMENT GUIDE

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Research and Development Series No. 50

HIGHWAY SAFETY OCCUPATIONAL PROGRAM DEVELOPMENT GUIDE

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PREFACE

As part of a national project conducted for the National Highway Traffic Safety Administration, U.S. Department of Transportation, The Center for Vocational and Technical Education conducted a nationwide search for curriculum materials related to highway safety occupations. These materials were then screened and synthesized to provide training materials used in the project entitled *Expansion of Vocational-Technical School Programs to Accommodate Highway Safety Manpower Requirements.*

This guide is a further synthesis of these curriculum and resource materials. It is intended to provide an overview of sub-baccalaureate career opportunities and related training materials in areas related to highway safety. It should be especially useful as a resource document to vocational education administrators, teacher educators, and state agency personnel responsible for planning and developing vocational and technical education programs in highway safety.

The Center wishes to express its appreciation to Paul F. Hill, Assistant Manager, National Safety Council, and Harland E. Samson, Professor of Education, The University of Wisconsin, for their valuable inputs as consultants to the project, and to the American Vocational Association, American Association of Junior Colleges, and the Highway Users Federation for Safety and Mobility for providing materials and assistance during the project.

Special recognition is also due Ronald Daugherty, project director, and project associates Kent Brooks and Carroll Hyder for their work in developing this document.

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FOREWORD

In the middle 1960's the number of deaths resulting from traffic accidents in America approached 50,000 per year. This further aroused a national concern for safer streets and highways. As a result of this concern, Congress passed the National Highway Safety Act in 1966 and established a firm foundation upon which federal, state, and local governments could combine resources to meet a coordinated, effective national safety effort. This legislation had many implications for expanding vocational and technical education to develop needed specialists and technicians in highway safety.

National studies were conducted in 1968 and 1969 to determine existing manpower shortages and to project future manpower shortages. These studies indicated that the majority of the jobs in highway safety were technical or skilled rather than professional. They further concluded that only a limited number of public educational institutions existed which offered occupational education programs closely related to highway safety manpower needs. Evidence indicated that existing informal and casual training arrangements in highway safety areas were not adequate to provide the great number of specialists and technicians needed in highway safety.

In June, 1970, the National Highway Traffic Safety Administration awarded a contract to The Center for Vocational and Technical Education, The Ohio State University, to study highway safety manpower development in vocational and technical education. One purpose of the project resulting from this contract was to aid and enlist the support of state and local vocational and technical education agencies and institutions in the expansion of existing training programs related to highway safety and to stimulate the development of additional programs in new and emerging occupations related to the field. This guide has resulted from that project.

The materials herein provide an overview of the field of highway safety, feature existing highway safety occupational programs and training materials, identify needs in eleven occupations relative to highway safety which have the greatest potential in terms of national priority need, and emphasize the resources needed in planning and developing occupational education programs.

It is hoped that this document which synthesizes the work, recommendations, and materials growing out of the project will serve as a resource in assisting the expansion and development of programs closely related to highway safety manpower needs.

Aaron J. Miller
Principal Investigator

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HIGHWAY SAFETY OCCUPATIONAL PROGRAM DEVELOPMENT GUIDE

INTRODUCTION

Intent of this Guide: This guide has been developed for people responsible for providing safety on America's highways and those charged with providing education for the world of work. The guide has the following five purposes:

1. To acquaint educators with an occupational field in which there exists a severe manpower shortage.
2. To identify sources of curriculum materials and references for program development in the areas of highway safety occupations.
3. To highlight some existing educational programs that are providing highway safety manpower.
4. To suggest some alterations to existing occupational preparation programs for the purpose of training people in the function of highway safety.
5. To encourage the development of new programs for training people in new and emerging highway safety occupations.

Those who should be particularly interested in the guide include regional and state highway safety administrators and their respective manpower coordinators; state vocational education directors, state directors of community-junior colleges and their respective staffs; individuals responsible for post-secondary vocational-technical education; and educational specialists responsible for programs in the areas of public service occupations, engineering technology occupations, health occupations, specialty office occupations, driver education, and vehicle inspection and repair occupations.

It should be noted that the area of highway safety, like other areas of technology, is in a rapid state of change. The contents of this publication should be checked against the more recent developments in the field before an attempt is made to develop programs to p oduce highway safety manpower.

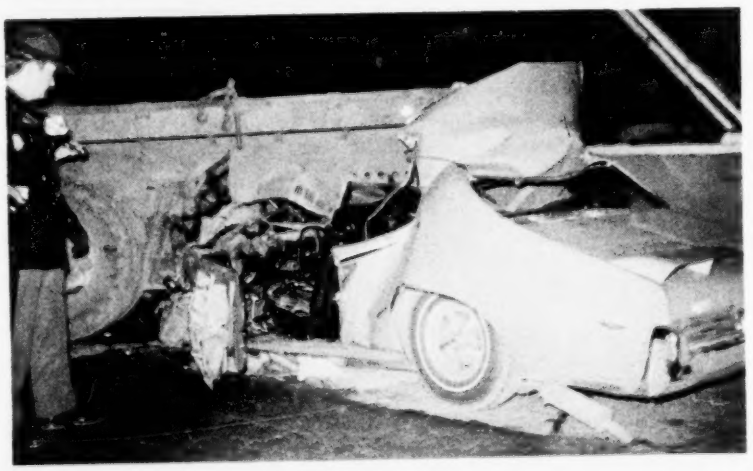
Vocational Education and the National Highway Safety Problem: Vocational-technical education has long been viewed as a key to the development of trained or skilled manpower. For many years, this nation has relied upon and given legislative impetus to the education of people for the world of work. Among the most recent legislation are the Vocational Education Act of 1963 and the amendments to that act in 1968. In both instances this legislation has focused attention upon the need for training more people in a wider variety of occupations, including new and emerging occupations.

The 1968 amendments provide federal grants to the states for the purpose of updating and expanding vocational education at both the high school and post-high school level. These grants are made available to each state on the basis of a plan submitted to the Commissioner of Education in such detail as to characterize the state's vocational programs, services, and activities in advance of one and five years. This clearly means that as changes in the manpower supply occur and as new and emerging occupations are created, these needs must be rated high enough in priority to be included in the state plan submitted annually by the office of the state director of vocational education.

The 1968 amendments also provide for such special projects as: 1) experimental projects to identify new and emerging occupations; 2) exemplary programs and projects for elementary and secondary occupational orientation and exchange of personnel between schools, manpower agencies, industries, etc.; 3) cooperative vocational education; 4) work-study programs; and 5) curriculum development for vocational education.

The 1968 amendments provide many opportunities for the development and/or expansion of vocational-technical education programs to accommodate highway safety manpower needs. The problem is to make the need for highway safety personnel so evident that their occupations become high in the priority of training needs. The scope of the problem of highway safety can be seen in some vital facts concerning America's streets and highways.

The National Problem: Approximately 111 million vehicles and a similar number of licensed drivers exist in our nation today. By 1975, it is estimated, the number of vehicles will have reached 118 million. More than 55 thousand people die in traffic accidents annually, while many times that number receive serious injuries. More than 13 billion dollars in property damage results annually from motor vehicle accidents. Our nation's problem is to stop this massive manslaughter and to decrease injuries and property damage that result from highway traffic accidents.



On September 9, 1966, public law 89-563 titled "National Traffic and Motor Vehicle Safety Act" was passed by the U.S. Congress. Its main purpose was to

reduce traffic deaths and injuries. The act focuses attention on the need for highway safety to be a prime design factor in manufacture and maintenance of automobiles. Several motor vehicle standards have resulted from this act.

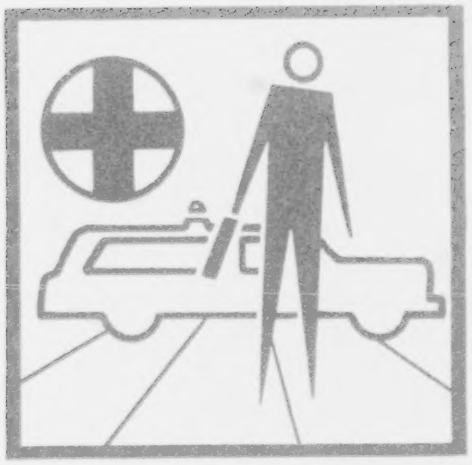
Congress also passed "The Highway Safety Act," public law 89-564, on the same date. The Highway Safety Act requires that each state have a highway safety program, approved by the U.S. Department of Transportation, designed to reduce traffic accidents, injuries, and property damage. As a result of this legislation, 16 highway safety standards have been issued by the U.S. Department of Transportation. These standards have been established for the purpose of giving states guidelines by which they may establish a safe highway system within their state. With changes in technology, society, and research findings, these standards are subject to change and will undoubtedly be modified and updated for the purpose of providing safer highways.

The bulk of the 1966 National Highway Safety Act is administered through the National Traffic Safety Administration within the U.S. Department of Transportation. Within this administration there exists an Office of Safety and Manpower Development for the purpose of increasing the supply and improving the skills of manpower required to implement effective highway and traffic safety programs at the federal, state, and local levels. Resulting from national manpower studies, recent information released by this manpower office has revealed that there are between 35 and 40 occupations or major job functions in the field of highway safety that are of a technical or sub-professional level. These studies indicate that more than 70 percent of the jobs identified in the area of highway safety require persons with vocational or technical training as opposed to people with baccalaureate degrees from college.

A recent national survey, conducted by The Center for Vocational and Technical Education, The Ohio State University, indicates that less than 100 post-secondary/public occupational programs exist for training highway safety personnel. Of these programs the large majority are in the areas of engineering technician training and police personnel training.

Under contract with the U.S. Department of Transportation, The Center sought the recommendations of vocational educators throughout the country for the development and expansion of programs to train highway safety personnel. As a result of this project, it became apparent that educators see an important role for vocational-technical education in preparing the highway safety manpower for the nation. It also became apparent that certain priorities could be established for the training of highway safety personnel in vocational education on the basis of manpower needs, highway safety priorities, vocational education priorities, and the availability of personnel and facilities to conduct these training programs.

It is hoped that the material included in this guide will stimulate additional interest in training personnel for highway safety occupations or job functions. The occupational categories are presented in order of priority, as established by vocational and technical educators.



EMERGENCY
MEDICAL TECHNICIAN—
AMBULANCE

In order to sustain and prolong life following highway accidents, there must be a quick response to motor vehicle crashes and proper first aid measures. Appropriate coordination, transportation, and communications are necessary to bring the injured and medical care together in the shortest practical time, without simultaneously creating additional hazards.

The American Medical Association states that an emergency is "an unforeseen combination of circumstances which call for immediate action." In the context of medical services, the emergency can be of any magnitude, from a single traffic casualty or cardiac arrest to a fire, an explosion, or a hurricane.

The American Medical Association further identifies the four basic components of a good emergency care system: 1) broadly based training for on-the-spot first aid; 2) a communications system which assures prompt response to the need; 3) well equipped emergency vehicles, staffed by emergency medical technicians-ambulance who are trained and equipped to provide all necessary life support at the scene and during transportation; 4) high quality emergency care facilities, staff, and equipment at the hospital level. Coordination of these four factors toward a single goal of quality care for the emergency victim is also necessary.

Manpower Requirements: There are approximately 25,000 emergency medical technicians-ambulance who are employed in the United States. National manpower surveys have shown a critical shortage of emergency medical technicians. These surveys indicate national manpower needs will range from 38,000 to 168,000 in 1978.

Description of the Emergency Medical Technician-Ambulance: The emergency medical technician-ambulance administers first aid to traffic accident victims both at the scene of the accident and during transport to the hospital. His tasks include: mouth-to-mouth resuscitation; administering mechanical aids to breathing and pulmonary resuscitation; cardio-pulmonary resuscitation; controlling bleeding with the use of tourniquets, inflatable splints, etc.; dressing and bandaging wounds; splinting fractures and broken bones; lifting and moving patients; extracting victims from automobiles; and making reports on events that occur during the call.

Existing Programs: In the past, the scope of vocational-technical education involvement in emergency medical technology has been limited primarily to continuing adult education in first aid. Generally, programs have been less than a year in duration. A network of 15 area comprehensive community colleges and vocational-technical institutes in Iowa are continually offering first aid courses and emergency medical care seminars. Training for coronary care unit personnel to staff hospital units and mobile units is offered in selected instituions in Iowa.

Since 1958, the Ohio Department of Education, Division of Trade and Industrial Education, has sponsored in-service occupational training for emergency medical services personnel. Currently, instructional programs are coordinated by a consultant and an assistant in emergency medical services. Programs of instruction are developed in consultation with a medical review board and a medical advisory committee. Teachers are selected and trained throughout the state by the consultant in emergency medical services.

There is a growing national need to expand short-term in-service programs through the network of area vocational schools, technical institutions and community-junior colleges within each state. Long-term programs (perhaps at the two-year associate degree level) are needed as preservice preparation to adequately prepare emergency medical technicians. Ongoing programs of this type are almost nonexistent.

In many states there is a lack of legal coverage for the "acts" of an emergency medical technician. The state of Iowa has a program in emergency medical technology ready for implementation, pending legislation. Many community-junior colleges and technical institutes are eager to begin emergency medical technology programs, but legal implications for the liability of technicians have retarded the development of these programs.

Other problems that have hampered maximum vocational-technical education involvement, include: lack of uniformity of titles and job descriptions based upon the functions to be performed; lack of overall state plans for implementing effective emergency medical services; and a lack of provisions for adequate salaries and determination of a base of operation for emergency medical services workers.

Area vocational schools, comprehensive community-junior colleges, and technical institutes are appropriate bases for offering both in-service training for persons already employed in ambulance services and preparatory programs for emergency medical technicians. Since vocational-technical education funds (federal, state, and local) are available for health occupations, training for emergency medical services are legitimate expenditures of these funds.

Multidisciplinary Nature of Emergency Medical Technology-Ambulance: The instructional staff in an emergency medical technology-ambulance program must cover content ranging from the use of cutting torches and expansion bars for extraction of victims from vehicles, to the skills for performing a tracheotomy to open a victim's breathing passage. Instructional personnel from several disciplines must be utilized on a part-time basis. This may necessitate employing a full-time coordinator to prepare curriculum materials, schedule instructional personnel, and organize and manage the program of instruction.

Program Curricula: The U.S. Department of Transportation contracted with Dunlap and Associates, Inc. (1969), to develop the following materials related to a basic training program for the emergency medical technician-ambulance: 1) *Concepts and Recommendations;* 2) *Course Guide and Course Coordinator Orientation Program;* and 3) *Instructor's Lesson Plans.* It is recommended that training agencies and institutions carefully review these materials and consider the alternatives and possible adoption of the materials for instructing emergency medical technicians-ambulance, particularly in the medical aspects of the training. An abbreviated outline of the subjects included in this material is shown in the Appendix (Exhibit 1).

A textbook and an instructor's guide in emergency care and rescue are available from the Ohio Division of Trade and Industrial Education. These materials provide for 60 hours of instruction, augmented and supplemented by 16 hours of hospital exposure to emergency medical care. The materials are comprehensive enough to prepare individuals for taking the national examination for registering as an emergency medical technician-ambulance.

Materials for planning and developing training programs for emergency medical services are available from numerous sources. Some of the most noteworthy are listed in the bibliography.

Summary Statements: The need for highly skilled ambulance personnel is recognized by a number of government and medical organizations in the United States. In order to meet this need, vocational and technical education should expand its role in determining the local manpower requirements and developing projections which will facilitate establishing training goals. Training programs within each state should be tested under circumstances which will permit validation of the completeness and appropriateness of such training. It will be essential that vocational and technical programs, courses, and workshops be planned in consultation with state health boards, medical groups, and other organizations concerned with emergency medical services.

MOTOR VEHICLE INSPECTOR

The questionable condition of the more than 100 million motor vehicles on the nation's streets and highways is a major national concern. The deterioration of a motor vehicle with time is inescapable, whether from normal wear or abuse, defective construction, improper maintenance, poor quality of original or repair parts, or inadequate skill of mechanics. The chances of the vehicle becoming involved in a crash increase with the deterioration of motor vehicle components. Most automobiles driven on American highways are at least three years old.

Recent research findings show that periodic motor vehicle inspection markedly augments highway safety. Top inspection can be accomplished only when competent personnel are employed to perform the inspection, to maintain proper station records, and to maintain proper inspection station performance standards.

Today, 42 states require periodic inspection of motor vehicles, a sharp increase from the 19 states with periodic motor vehicle inspection programs in 1964. Periodic motor vehicle inspection refers to a requirement by law for motor vehicles to be examined on a regular basis for unsafe operative conditions. The purpose of such examinations is to identify mechanical or equipment defects or failures which, if left uncorrected, could endanger the lives of vehicle drivers and other users of the highway transportation system. The establishment of more stringent inspection regulations where laws already exist and support of the establishment of laws in states not previously covered has led to increasing needs for motor vehicle inspectors.

Manpower Requirements: Approximately 15,000 people are working as motor vehicle inspectors in the United States. The need for inspectors will more than triple by 1978 if all states rigidly enforce laws concerning periodic motor vehicle inspection. A critical shortage of qualified motor vehicle inspectors almost always exists within a state during the implementation of new state regulations.

Description of the Motor Vehicle Inspector: The duties of the motor vehicle inspector include: 1) inspecting and testing systems, sub-systems and components on automobiles, buses, trucks, and motorcycles to see that they conform with required safety standards; 2) identifying and reporting unsafe vehicular operative conditions; and 3) recommending service or repair. The motor vehicle inspector may service and repair systems, sub-systems, and components as necessary; maintain records of all vehicular inspection procedures and corrective procedures; and provide record summaries at the request of the motor vehicle station inspector.

Existing Programs: A training program to qualify automobile mechanics as motor vehicle inspectors was developed in 1968 by the Kentucky Division of Vocational Education, State Department of Education, in cooperation with the Kentucky Motor Vehicle Inspection Division. The program, which provides identical instruction throughout the state, is conducted at area vocational education schools (including extension centers) readily accessible to potential inspectors. Program instructional content is validated by other cooperating agencies for accuracy of content, completeness, and effectiveness.

The Wisconsin Board of Vocational, Technical, and Adult Education sponsors occupational education courses for periodic motor vehicle inspection personnel. These courses are coordinated throughout the state by five regional traffic safety specialists. Job entry and in-service courses are provided through cooperation with agencies responsible for motor vehicle inspection.

Special seminars and workshops for motor vehicle inspectors are periodically conducted by vocational and technical education departments in other states to provide inspectors with information needed to comply with new state motor vehicle inspection regulations. Some schools, which offer occupational instruction in automotive services and automotive technology, provide special instruction in the elements of periodic motor vehicle inspection for highway safety. For example, in the state of Connecticut arrangements are made whereby the automotive services shops are licensed as official motor vehicle inspection stations, thus providing practical experience in periodic motor vehicle inspection procedures. Only slight modifica-

tions in existing automobile mechanics or services programs are necessary to accommodate instruction in motor vehicle inspection. Little additional equipment is necessary.

The difficulty experienced in attempting to provide formal instruction in the classroom setting has prompted the State of Georgia to utilize mobile units or vans for training motor vehicle inspectors. An itinerant instructor travels with the van to various motor vehicle inspection establishments and provides instruction as needed.

Inter-agency Cooperation: Vocational and technical education planners and motor vehicle inspection agencies and establishments must necessarily work together in marshalling resources to provide instructional activities for motor vehicle inspectors and in making decisions on who should do what task. Advisory committees and task forces composed of individuals from the various agencies and institutions should be established to make surveys, draft proposals, and make recommendations which would link instructional activities with state goals and objectives.

Instructional staffs have been recruited from state motor vehicle departments, police traffic departments, and local garages with experience in official motor vehicle inspection. In most cases, it has been necessary to train personnel for instructing motor vehicle inspectors. Motor vehicle inspection officials usually provide the instructor orientation services.

Program Curricula: Most states which require periodic inspection of motor vehicles have developed instruction manuals for motor vehicle inspection personnel. These manuals are the foundations from which the states' motor vehicle inspection programs are developed. These manuals will serve as a basis for developing training programs within the states. The subject elements incorporated within a manual are based upon the provisions of the individual state's motor vehicle inspection laws. The prime elements to be included in motor vehicle inspection are shown in Exhibit 2 in the Appendix. Other elements vary according to each state's inspection laws.

Initial efforts to determine the scope of motor vehicle inspection, the duties required of the motor vehicle inspector, and special training and/or experiences necessary for entry and advancement in the field have been made by Booz, Allen and Hamilton, Inc. (1968) and the Stanford Research Institute (1969). Segments of these efforts are exhibited in the Appendix (Exhibits 3 and 4).

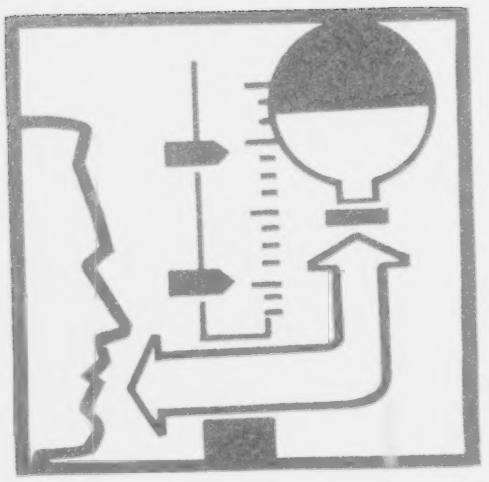
The American Association of Motor Vehicle Administrators (1970) has developed *Periodic Motor Vehicle Inspection: A Course of Study for Uniform Inspection Procedures.* This material, which includes 148 35mm slides and a discussion guide, is to be used by the course instructor to provide motor vehicle inspectors with information necessary to conduct standardized inspections. The material is based on inspection specifications previously prepared by the American Standards Institute and the Automobile Manufacturers Association. The material applies to passenger cars and motorcycles but not to commercial vehicles and buses. The material is to be supplemented by vehicle inspection manuals furnished by each state.

An instructor's manual for a three-week course in administration and supervision of motor vehicle inspection was prepared by the Traffic Institute, Northwestern University (1970) under contract with the Automobile Safety Foundation and the Highway Users Federation for Safety and Mobility. This material is divided into several units which include unit objectives, suggested methods of instruction, time allotments, lesson outlines, and suggested references.

Motor vehicle inspection curriculum materials developed by the State of Kentucky (1968) are directed to teaching information, demonstrating actual inspection procedures, and on-hands practice of motor vehicle inspection. Instructional materials include an instructor's manual, lesson plans, 35mm film strip with audio tape, and criterion tests.

Summary Statements: There is increased momentum to require periodic inspection for unsafe operating conditions of all motor vehicles currently in use and a demand for correcting these conditions before the vehicles are permitted back on the roadways. Periodic inspection procedures have been only mildly effective in many instances because the personnel doing the inspection have lacked specific training for the inspection function. The scope of essential knowledge and skills encompassed by the motor vehicle inspection function is broad enough to justify formal training programs in public educational institutions.

Automotive service and repair programs in secondary and post-secondary educational institutions have most of the resources needed to provide instruction for potential motor vehicle inspectors, both preservice trainees and those employed by law enforcement agencies and automobile service and repair establishments. A variety of learning experience can be provided by these programs as necessary, including introduction of unique knowledge and skills needed for inspecting motorcycles, commercial buses, and trucks.



BREATH EXAMINER
SPECIALIST

The use of alcohol by drivers and pedestrians leads to approximately 25,000 deaths and at least 800,000 accidents in the United States each year. The annual total of alcohol-involved fatalities on the highways exceeds the sum of all the murders in the United States and twice the number of fatalities in railroad, marine, and air transportation combined. This is especially tragic in that much of the loss of life, limb, and property involves completely innocent parties.

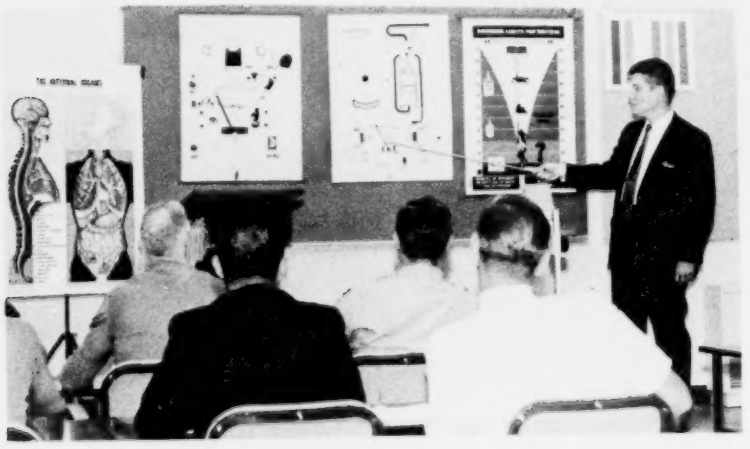
The staggering rate of alcohol-related highway accidents has prompted states to reexamine existing laws relative to driving while drinking, particularly in supplementing "implied consent" legislation and developing specifications for certifying breath examiner specialists with responsibilities in identifying intoxicated drivers. This concern has also extended to the use of drugs by increasing numbers of youth and adults.

Manpower Requirements: National manpower surveys have shown that approximately 3,000 breath examiner specialists are employed across the United States. Estimated manpower needs for 1978 range from 10,000 to 35,000. Either figure represents many more breath examiner specialists than are presently trained and employed.

Description of the Breath Examiner Specialist: The breath examiner specialist uses a breath test instrument which is equipped to give a calibrated reading of the blood-alcohol content in individuals who have drunk alcoholic beverages. The breath examiner specialist is required to prepare the instrument for operation, conduct a test, and record the results in a written report. It may be necessary for the specialist to conduct preventive maintenance on breath testing instruments and repair such instruments as necessary. He may be required to testify in court cases.

The time required for administering breath tests for blood alcohol content is an uncontrollable variable. Thus, breath tests are administered as necessary by traffic patrolmen, police chiefs, hospital laboratory technicians, and sheriffs. Since breath examiners are summoned as needed, the position usually represents a function of a total job.

Existing Programs: State motor vehicle divisions, boards of health, community-junior colleges, and other agencies and institutions are cooperatively planning training programs for breath examining specialists. A few states have already implemented training programs.



The State of North Carolina has designated the North Carolina State Board of Health as the agency governing alcohol testing within the state. In turn, the State Board of Health has designated the North Carolina Department of Community Colleges to train specialists. The State Board of Health adopts regulations governing breath and blood-alcohol tests, the equipment used in administering these tests, the issuance and duration of breath examining permits, and the character and competency of breath test equipment operators and blood analysts. Advisory bodies have been set up to recommend policies and procedures for training. The North Carolina Department of Community Colleges has two full-time coordinators for breath examiner training. Programs can be offered in any of the community colleges and are established upon request of various law enforcement agencies.

A state law enacted in 1969 directs the Wisconsin Division of Motor Vehicles to approve methods of chemical analysis of the breath. The same agency approves training manuals and courses throughout the state for training traffic officers in chemical analysis; certifies the qualifications and competencies needed by individuals to conduct such analysis; accepts or rejects equipment to be used by traffic officers for chemical analysis of a person's breath; and issues permits for personnel to conduct breath examinations. The Wisconsin Board of Vocational, Technical, and Adult Education has appointed five traffic safety coordinators to work with agencies requesting education and training in highway safety, including alcohol in relation to highway safety.

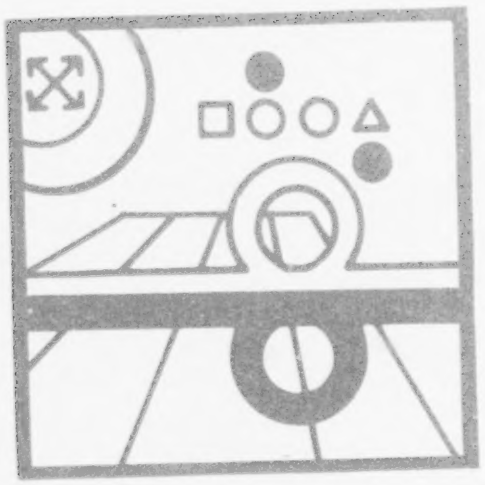
Program Curricula: The North Carolina Department of Community Colleges has developed curriculum materials for use in training breath examining specialists. This material is in loose-leaf notebook form to allow for rapid changes in breath examining procedures, as well as the addition of new materials. An abbreviated outline of the curriculum contents of the North Carolina program is presented in Exhibit 5 in the Appendix.

Training materials for breath examining specialists are being developed under contract with the U.S. Department of Transportation. These materials, which should be available in late summer 1971, will be pilot-tested and adopted in programs of instruction throughout the country.

Training materials are available from the University of Indiana, which offers breath examiner courses as requested by various agencies responsible for enforcing impaired driving laws. It is recommended that *Alcohol and the Impaired Driver* (American Medical Association, 1968) be considered as a textbook for breath examiner programs. Also, Dubowski's (1970) publication *Measurement of Ethyl Alcohol in Breath* will serve as resource material. These materials are cited in the bibliography.

Booz, Allen and Hamilton, Inc., (1968) and the Stanford Research Institute (1969) have attempted to delineate the duties of the breath examiner specialist and the special training and/or experience necessary for his entry and advancement in the field. Segments of these efforts are shown in Exhibits 6 and 7 in the Appendix.

Summary Statements: Breath testing is one of the most feasible and practical methods for law enforcement personnel to detect blood-alcohol levels in drinking drivers and pedestrians. New breath examining test methods have been developed which require special training for persons employed by various organizations. The initiation of programs to train breath examiner specialists will help to alleviate the drinking and driving problem. Individuals who drive while under the influence of drugs are also dangerous, and much attention is being focused upon the need to detect, apprehend, and otherwise control the use of drugs by motor vehicle operators. Therefore, a need arises for trained personnel to work in this distinctive area of highway safety also.



HIGHWAY SAFETY
ENGINEERING TECHNICIAN

All highway projects should contribute to the improvement of the driving and walking environment. It is estimated that the safety features engineered into the complete Interstate System alone will help save 8,000 lives a year. But because highways and streets must accommodate increasing numbers of motor vehicles, drivers, passengers, and pedestrians, an even greater need has been created for modernizing existing roads and engineering safety features into new highway transportation facilities.

It has been said that the number of deaths resulting from a faulty driving and walking environment is somewhat proportional to the number of well trained highway safety engineering technicians. Highway safety engineering technicians include all personnel, from technically trained aides to highway engineers who are involved in distinct safety aspects of highway design, construction, and maintenance. Highway safety engineering technicians help to insure that the risk of accidents and resulting deaths, injuries, and property damage are kept at a minimum.

Description of the Highway Safety Engineering Technician: The highway safety engineering technician is concerned with "below the surface" aspects of the highway and street transportation environment. His duties usually relate to the physical factors associated with the environment in contrast to the informational and traffic control factors in which the traffic engineering technician is involved. The highway safety engineering technician will most likely work in direct support of the professional engineer, the architect, economist, or city planner. The highway safety engineering technician must apply numerous highway safety standards in designing and planning new highway transportation systems and in modifying existing facilities. These standards relate to grade, slope, curvature, and alignment features. He is also concerned with the width of lanes, median zones, barriers and curbs, road discontinuities, and the skid resistance of pavements. The highway safety engineering technician is called upon to make calculations, draft detail construction drawings, develop highway safety-related construction specifications, and inspect construction work and materials. He may assist in community planning projects, road surveys, and field surveys of road conditions.

Manpower Requirements: As early as 1956, the United States was deeply concerned about the shortage of engineering technicians. At that time the Engineering Manpower Commission reported that a 133 percent increase in the demand for civil engineering technicians in transportation would occur during the period of 1965-1976. The same report predicted a 58 percent increase in the demand for civil engineering technicians in construction activities for the same period, in spite of a stable situation for the demand for civil engineers for the construction industry. Also, it was estimated that there would be a 27 percent increase in demand for civil engineering technicians at the local government level and a 22 percent increase in demand for civil engineering technicians at the state government level. All figures were based upon the generally accepted figure of three technicians for each practicing professional engineer.

More recent national surveys have shown a critical shortage of highway safety engineering technicians. There are approximately 5,000 persons employed as highway engineering technicians in the United States, although there is sufficient evidence which indicates that at least twice this number are needed. It is estimated that optimum needs for highway safety engineering aides will exceed 41,000 in 1978.

Existing Programs: There are at least 240 occupational education programs in public educational institutions which prepare personnel for much of the knowledge and skills required by a highway safety engineering technician. These programs are found in community-junior colleges, technical institutes, and area vocational education schools. Most of these programs are entitled civil or highway technology and are usually two-year associate degree programs. There were almost 14,000 students enrolled in civil technology programs in 1969, according to the U.S. Office of Education. This number includes preparatory and supplementary training. Supplementary training refers to short-term certificate-type programs for employed personnel.

Occupational education programs in civil engineering technology with highway and structural options exist in several public educational institutions across the nation. These programs are being expanded to include other options as the need for highway engineering technicians is more clearly identified. Distinctive highway safety related competencies, concepts, and skills are being introduced in program curricula at a rapid pace.

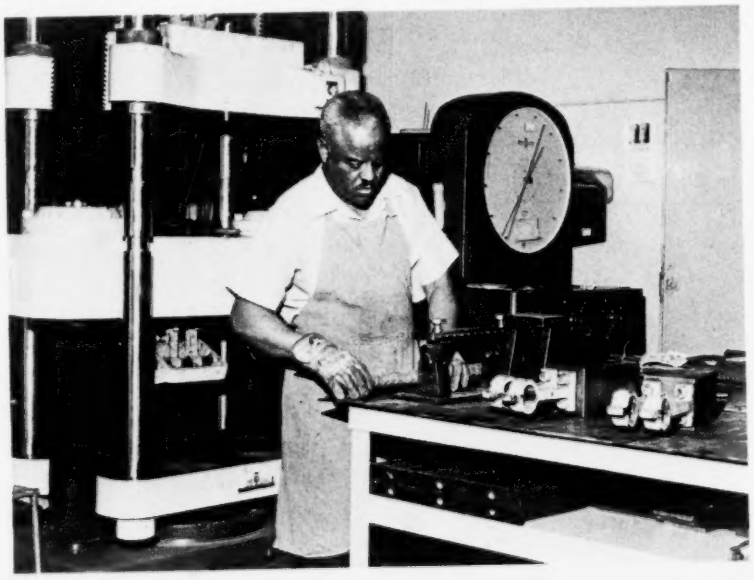
The Texas State Technical Institute, Waco, Texas, conducts a two-year associate degree program in civil engineering technology with provisions for a highway construction option. Students branch off into specialized learning activities at the beginning of the second year. The highway construction option includes instruction in highway signing and delineation, guard rails, street lighting, bridge construction, construction operations, etc. Other options are at various stages of development by the Texas State Technical Institute.

A serious shortage of qualified highway technicians and engineers in the State of New York has prompted its departments of transportation and education to collaborate in developing programs to train highway technicians. The programs are expected to provide additional technicians and engineers by upgrading people already employed in technical jobs. The programs enroll personnel who plan, design, construct, operate, and maintain state highways. Local boards of education and other sponsors of adult education programs in New York are encouraged to offer this program. Students are attracted from the State Department of Transportation, construction firms, and public works departments of counties, cities, and townships.

Inter-Agency Cooperation: Occupational education must be employer-based. The development and expansion of programs in highway safety engineering tech-

nology must be supported by a consortium of employers from local and state highway departments and private construction and engineering firms. The overriding emphasis should be on providing learning activities directly related to the real world of work, including cooperative work-study opportunities or internship arrangements which link the occupational education program with a job.

Program Curricula: Quality standards proposed by such groups as the American Association of Junior Colleges and the American Society for Engineering Education are available for use in planning, developing, and implementing engineering technology curricula. Much information needed to plan and develop highway safety engineering technology programs is available from these sources. Most of the existing curriculum materials are designed for two-year associate degree programs in community-junior colleges and technical institutes.



There have been several studies to determine what major subjects should be incorporated into civil technology curricula and the time that should be allotted to each subject. One such study was conducted by Dobrovolny (1968) and reflects standards established by previous studies by the American Society for Engineering Education and the U.S. Office of Education. The basic curriculum elements and time allotments derived from this study are presented in Exhibit 8 in the Appendix.

In 1966, the U.S. Office of Education prepared a curriculum guide entitled *Civil Technology: Highway and Structural Options*, designed to assist administrators, supervisors, and teachers to plan, develop, and evaluate programs. The guide is comprised of course outlines, suggested program operation procedures, laboratory layouts, texts and references, lists of laboratory equipment and its cost, and a selected list of scientific and technical societies. The guide will be helpful in developing or expanding programs to train highway safety engineering technicians. An overview of the suggested curriculum for the highway option is shown in Exhibits 9 and 10 in the Appendix.

A basic curriculum for a certificate program in civil engineering technology was developed by the California State Department of Education in 1963. This curriculum was based upon job descriptions and analyses supplied by industry throughout the State of California. An analysis of the job descriptions and job analyses showed that 57 percent of the civil engineering technician's time was spent in activities involving instruments, drawings, reports, records, handbooks, equipment, materials, and activities in production. The remainder of the time was spent in the following activities: planning, 13 percent; supervising, 12 percent; coordinating, 10 percent; and inspection, 8 percent. Exhibit 11 shows the recommended subject matter elements, which represent an analysis of the job descriptions and job analysis supplied by industry. The curriculum elements shown in Exhibit 11 can be supplemented to meet the standard set by the State of California for an Associate in Arts degree in civil engineering technology. All basic courses can serve as a foundation for further study beyond the degree or certification that is issued so that students may continue their education throughout their careers.

The information presented in Exhibits 12 and 13 in the Appendix represent efforts by Booz, Allen and Hamilton, Inc., (1968) and the Stanford Research Institute (1969) to identify the scope of highway engineering technology, the duties involved, entering education requirements, entering experience requirements, and special training required upon appointment to the position of highway safety engineering technician. Both preparatory and in-service training is recognized as being essential to successful job performance. The focus of the basic curriculum developed by the Stanford Research Institute is on the multidisciplinary approach to training. It is structured so that resources from several disciplines and skill areas are combined. These disciplines currently exist in most of the community-junior colleges.

The New York State Department of Transportation and the New York State Department of Education collaborated to plan and develop the following highway technology subject area teacher's guides: *Highway Drawing* (Unit II) (1968); *Elements of Highway Planning* (Unit IV) (1969); *Soils and Drainage* (Unit V) (1967); and *Highway Design and Estimating* (Unit VI) (1968). Additional materials are being planned and will be prepared in final form on a priority schedule identified by the New York State Department of Transportation. These will encompass the following subject areas: construction and inspection; highway structure; highway maintenance; and traffic engineering. The subject areas have been planned in the sequence shown. The existing materials consist of lesson plans arranged in a two-column outline format. The content topics and subtopics are listed in one column. Suggested teaching points and techniques are given in the second column. Each lesson plan includes references, lesson objectives, questions for review and student assignments. Since the material is designed specifically for employed personnel, simulated skill building exercises are not emphasized to a great degree. However, student practices are integrated into the curriculum when feasible, particularly in the highway drawing and highway esti-

mating subject areas. Abbreviated outlines in *Elements of Highway Planning, Highway Design and Estimating,* and *Highway Drawing* are presented in the Appendix (Exhibits 14-16).

Summary Statements: Due to the permanence of streets and highway structures and the increasing traffic loads which these structures must accommodate, many physical factors and other environmental elements which contribute to highway safety present a great need for highway safety engineering technicians. Vocational and technical educational institutions are challenged to provide both in-service and preparatory instruction for highway safety engineering technicians. Many of the students will likely come from agencies and firms presently employing personnel who desire to move into highway safety positions but lack the necessary technical knowledge and skills demanded. Training may be in the form of short courses, seminars, workshops, certificate programs, and the two-year associate degree type programs. With slight modifications, existing resources in civil and highway engineering technology and similar programs of instruction are adequate for training highway safety engineering technicians. With appropriate cooperation between various agencies and firms involved in highway engineering functions and public educational institutions, manpower development needs can be identified and training provided which will insure that safety is of primary concern in highway design, construction, and maintenance.

TRAFFIC ENGINEERING TECHNICIAN

The design and planning of new transportation facilities and the modification of existing facilities takes into account many information factors associated with visibility, communication, signaling, and traffic control. Characteristics and attributes of the roadway and its surroundings influence the initiation and severity of traffic accidents. Artificial illumination, lane markings, warning and direction signs, speed limit signs, zebra pedestrian crossings, and street lighting can minimize motor vehicle accidents, improve traffic flow and increase highway capacities. The sizes, shapes, location, and kinds of traffic control devices are generally the result of applied highway engineering knowledge and skills.

It has been determined that the systems of communication and signaling devices, factors associated with visibility, and other "above the surface" environmental characteristics, features and attributes of the roadway and its surroundings can and must be improved. New concepts in traffic sign design, such as using meaningful color, shape, and pictures instead of words, may help reduce accidents and ease driver confusion. Engineering studies must be used to upgrade traffic control devices and replace outmoded devices with new ones that conform with standards for excellence.

A program of identification and surveillance of hazardous locations is essential to a total highway safety effort. Speed zones need to be established according to engineering and traffic studies. Efforts must be made to lessen misinterpretations of traffic control signals by operators and pedestrians by applying greater conformity and continuity in signs. Roadway informational messages must be reconciled with similar information on maps, road guides, and advertisements.

Such activity, if fully realized, would mean upgrading personnel currently employed in traffic engineering and would necessitate hiring additional traffic engineering technicians in highway, traffic, and engineering departments across the nation.

Manpower Requirements: There have been a number of surveys to determine the shortage of traffic engineers and traffic engineering technicians in the United States. A survey conducted in 1963 by the Institute of Traffic Engineers showed a need for 1,400 more traffic engineers than the 7,000 employed at the time.

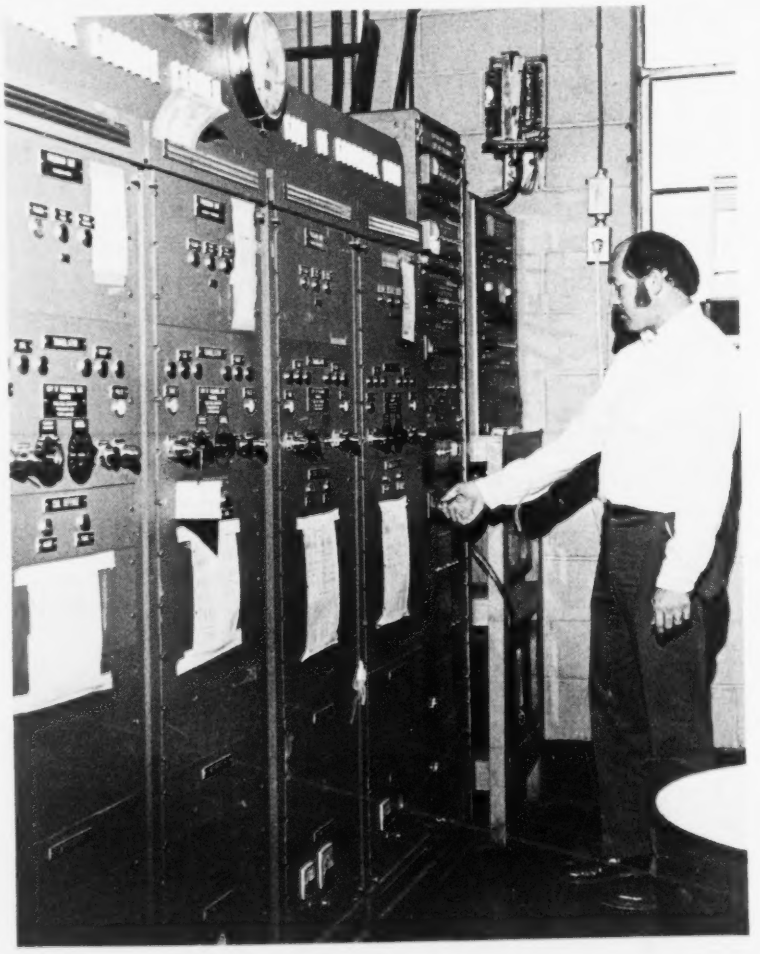
Koert (1969) reported 1) that the shortage of traffic engineering technicians is even more critical than the shortage of traffic engineers; 2) that relatively few training programs exist for traffic engineers; and 3) that engineers hire whatever personnel they can obtain and attempt to bridge the educational deficiencies with in-service training.

A survey by Booz, Allen and Hamilton, Inc., (1968) showed that slightly more than 200 traffic engineering technicians were employed in state level engineering offices in 1968. The same study reveals 2,200 traffic engineering technicians may be needed at the state level by 1977.

A survey by the National Association of Counties Research Foundation (1969) identified approximately 1,000 traffic engineering technicians employed in 1969 by local (city and county) agencies and firms involved with traffic engineering functions. Having examined field data and substantive studies of the highway safety needs in traffic engineering, the foundation suggested that approximately 5,700 traffic engineering technicians will be needed at the local level in 1978.

Description of the Traffic Engineering Technician: The traffic engineering technician works under the direct supervision of the traffic engineer and performs many of the following tasks: installing equipment used in obtaining traffic data; collecting traffic data (parking accumulation rates, accident frequency at intersections, etc.); computing traffic signal timing; studying traffic demands; observing the operation of traffic control devices to determine their effectiveness; determining appropriate types and applications of traffic control devices; drawing geometric designs and sketches of highway markings; preparing recommendations for the design, construction, installation, and maintenance of traffic control devices; supervising the installing, testing, and maintenance of traffic control devices; supervising the placing of signal lights, speed limit signs, center lines, stop signs, etc.; designing non-electrical traffic control devices in accordance with highway safety standards and regulations; and acting as a liaison between traffic engineering departments and police traffic agencies and other local and state highway safety units.

Existing Programs: Although occupational programs in civil and highway technology are not neces-



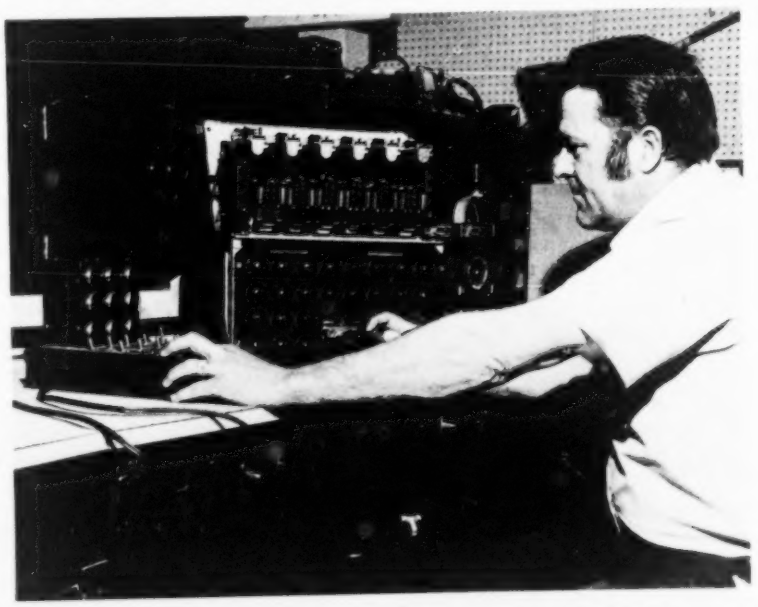
sarily traffic engineering-oriented, many existing programs provide instruction in various aspects of traffic engineering technology. Existing programs in electrical-electronics technology often provide instruction in traffic control devices. According to the U.S. Office of Education, 14,000 students were enrolled in electrical technology programs and 74,900 students were enrolled in electronic technology programs in 1969.

Programs in traffic engineering technology are at various stages of development in several community-junior colleges and technical institutes across the United States. The American Association of Junior Colleges, under contract with the National Highway Traffic Safety Administration, is pilot-testing two traffic engineering technician programs. Lansing Community College, Lansing, Michigan, began the pilot program in the fall of 1970, using the publication *Traffic Engineering Technician Programs in the Community College* (Koert, 1969). Columbus Technical Institute, Columbus, Ohio, will pilot a similar program beginning the summer of 1971. The Texas State Technical Institute, Waco, Texas, is planning a traffic engineering technology option for an existing two-year associate degree program for civil engineering technology. The existing program, which already has a highway construction technology option, will allow students who have been enrolled in civil engineering technology for one year to specialize in traffic engineering technology the second year. The specialized curriculum in traffic engineering technology will include the following elements: instruments in traffic counts; design and construction of traffic control devices; communications in traffic control; manufacture of paints, reflectors, etc., for traffic control purposes; local studies in traffic control; practices in highway transportation planning; coordination of traffic flows; and school bus route locations.

It is evident that supplementary and in-service training opportunities should be provided for skilled craftsmen working in traffic control to enable them to advance to technical positions in highway safety. Advancement is often slow because of a lack of specialized knowledge and skills needed to plan, design, construct, and maintain traffic control systems.

Training programs for traffic engineering technicians must encompass some subject elements not directly related to highway safety, such as electricity-electronics and mechanics that relate to traffic control systems. Distinct programs of instruction in electricity and electronics may be required for training in the electrical aspects of traffic control systems.

Program Curricula: Koert (1969) outlined the work and educational requirements for the traffic engineering technician and developed a basic, flexible curriculum for a two-year porgram in traffic engineering technology. (Refer to Exhibit 17 in the Appendix.) His curriculum guide, *Traffic Engineering Technician Programs in the Community College*, includes basic science and technical and nontechnical courses. Koert suggests that local traffic characteristics, student characteristics, and existing training programs should be considered in planning programs for training traffic engineering technicians. A careful study should be made of local employment needs, logically with the assistance of a local advisory committee, to determine elements needed in local programs of instruction.



Booz, Allen and Hamilton, Inc., (1968) and the Stanford Research Institute (1969) have delineated the entry and refresher training needed by traffic engineering technicians. This information is contained in Exhibits 18 and 19 in the Appendix.

The New York State Department of Education and the New York State Department of Transportation jointly developed a training program for traffic engineering technicians to upgrade employed highway traffic engineering technicians. An outline of subject elements incorporated in the Highway Planning Section of this program is shown in Exhibit 14 in the Appendix. (Refer to previous unit on Highway Safety Engineering Technician) In the original form, these materials consist of lesson plans arranged in a two-column format. The materials include both subject matter and suggested teaching techniques. Some student practice exercises are presented.

Summary Statements: To realize the national goal of reducing traffic accidents, it is important that improved engineering, and technological developments related to traffic control devices be applied to highway and street systems as rapidly as possible. Full realization of these goals means the employment of additional traffic engineering technicians, and the upgrading of

personnel now employed in traffic engineering functions. The greatest need for training programs in traffic engineering technology is found in larger urban areas which have traffic engineering divisions (often within the public works department).

Existing programs of instruction in civil and highway technology frequently encompass instruction directly related to traffic engineering technology and may be the most logical departure point for expansion of training activities in traffic engineering technology. Greater specialization may be possible as these programs are expanded.

SCHOOL BUS DRIVER

Perhaps no other driving occupation carries a heavier burden of responsibility than school bus driving. American tax payers entrust expensive equipment and the lives of some 19 million school children to the drivers of school buses. Through the years there have been continuous problems in selecting and training capable school bus drivers. Maintaining school buses in safe operating condition and establishing uniform laws, regulations, and operating procedures for school transportation systems across the country have also presented problems. However, state education departments have been quite active in the promulgation, dissemination, and implementation of standards relative to school bus transportation and in providing leadership and assistance in the operation and management of school bus transportation systems.

School systems provide their own buses and/or contract with private firms for school bus transportation services. Large systems usually have full-time directors with the responsibility of overall administration of the school bus safety program. Directors of school bus transportation services are assisted by school bus drivers, route managers, school bus maintenance foremen, and school bus mechanics and servicemen.

Because school bus driving is often a part-time occupation, many senior high school and college students, housewives, and self-employed men across the nation supplement their incomes by driving buses in the morning and afternoon. However, school bus drivers often drive classes and groups on field trips, athletic events, debate meetings, and school social functions. It is becoming increasingly necessary to provide some form of driver training as a prerequisite to employment, and as a requirement for continuing employment, as a school bus driver. Clearly specified course content and school bus driver certification requirements must be readily available to school bus driver-trainers and training planners.

Manpower Requirements: In 1969, the number of school bus drivers employed in the United States exceeded 416,000. These drivers are employed by public schools, private schools, and by private firms which contract for transportation services. It is estimated the manpower needs in 1978 will rise above 582,000.

Description of the School Bus Driver: It is recognized that the drivers of school buses should have a high degree of safety awareness, driving skills, and teacher-like understanding of the pupils they transport to and from school everyday. Their responsibilities include: operating the school bus safely; preventive maintenance of the school bus; maintaining a safe environment inside the school bus; maintaining discipline on the school bus during the route to and from school; handling emergency situations, including administering first aid in the event of injuries or sickness; discussing transportation problems with school officials and parents; and completing school bus transportation reports.

Existing Programs: Many state education departments endorse the establishment of basic and refresher and/or advanced training for school bus drivers. It is recognized that school bus drivers should be provided with opportunities to develop knowledge and skills affecting school bus driving responsibilities.

The Wisconsin Department of Public Instruction and the Wisconsin Board of Vocational, Technical, and Adult Education jointly sponsor an organized training program for school bus drivers. The Department of Public Instruction administers educational activities through field service coordinators employed by the Bureau of Vocational, Technical, and Adult Education. Vocational and technical education facilities are utilized in training programs. Instructional offerings include preservice programs for beginning drivers, four-hour workshops held by the Department of Public Instruction each year, and a twelve-hour in-service course sponsored by vocational and technical education schools. One-week instructor training courses are provided through the state universities in Wisconsin. Instructor training courses are also available to the driver instructors employed by private contractors.

The Georgia Division of Vocational Education, State Department of Education, employs an itinerant teacher who travels in a mobile unit to all county school bus maintenance shops and provides instruction to school bus drivers. The course is approximately one week in duration. School bus drivers are tested for highway safety knowledge, skills, and physical deficiencies in sight, and driving awareness and reaction. All school bus drivers in Georgia are tested and evaluated each year, and the itinerat teacher instructs, tests, and evaluates approximately 2,000 of them annually.

A school bus driver training consultant is employed by the Ohio Trade and Industrial Education section of the Division of Vocational Education. The consultant works in close harmony with the Division of School Finance to select and train school bus driver instructors in 631 school districts in Ohio. Currently, 143 instructors are certified to teach school bus driver education. Field coordinators assist local school districts in planning, organizing, and managing school bus driver training courses. Plans are underway to sponsor training programs for drivers of small vehicles used in transporting handicapped students.

Numerous state colleges and universities sponsor school bus dirver safety clinics and workshops. Millersville State College, Millersville, Pennsylvania, sponsors a one-day school bus drivers' safety clinic for drivers employed by the Lancaster County School District. The Pennsylvania State University, Pennsylvania Park, Pennsylvania, offers pupil transportation courses.

The employment of qualified bus driver training instructors has been the cornerstone of effective programs of instruction for school bus drivers. The instructor's responsibility is to select, organize, and effectively utilize instructional materials. Some schools have utilized a team (or teams) of teachers on a full-time basis to instruct and advise school bus drivers in technical and nontechnical aspects of school bus transportation. This provides a means for periodic evaluation of bus driver skills, either through trial driving or by instructors accompanying drivers on school bus routes.

Personnel now involved as instructors in school bus driver training programs in the United States include directors and supervisors of school bus transportation services, driver education teachers, school principals, school bus maintenance employees, school bus manufacturers' representatives, motor vehicle inspectors, public safety directors, driver license examiners, and police traffic officers.

Program Curricula: Numerous state departments of education have prepared various types of materials relative to school bus driving. Design and form of the materials are based upon the instructional settings in which the materials will be used and the types of instructional activities to be provided, e.g., short-courses or clinics at universities, community-junior colleges, area vocational education schools, or mobile units (specially equipped school buses). Available materials relative to school bus driving exist in three forms: 1) handbooks designed primarily for self-instruction rather than for use in systematic training courses, 2) reference materials related to school bus standards, rules, and regulations to be used by school bus administrators, drivers, and maintenance foremen, and 3) instructor's manuals for use in organizing and managing training programs.

Of particular note in this regard is the State Education Department of New York where noteable progress has been made in the promotion of school bus safety through development of an instructor's manual for school bus driver training. A section of this manual includes suggestions for organizing a course for school bus drivers. These suggestions are included in Exhibit 20 in the Appendix.

Joint efforts of the Wisconsin Department of Public Instruction and the Wisconsin Board of Vocational, Technical, and Adult Education have resulted in a transportation handbook for drivers and an in-depth course outline for experienced school bus drivers. The latter material is designed to increase school bus transportation knowledge and skills beyond the minimum techniques and knowledge required of a holder of a school bus driver's license.

Three school bus driver training manuals were developed by the Ohio Trade and Industrial Education section of the Division of Vocational Education, and the Ohio Division of School Finance (Ohio State Department of Education). A pre-employment manual (1970) enables prospective school bus drivers to become acquainted with the school bus driving occupation, including entrance requirements. The pre-employment manual is used to prepare individuals to take a driving and written test for a school bus operator's license. A basic driver manual (1970) provides in-depth coverage of the knowledge and skills required as a school bus driver. A third manual, an advanced driver course (1969), provides a review and further treatment of the many duties and responsibilities of a school bus driver. Instructor manuals have also been prepared for use in conjunction with each of the three manuals.

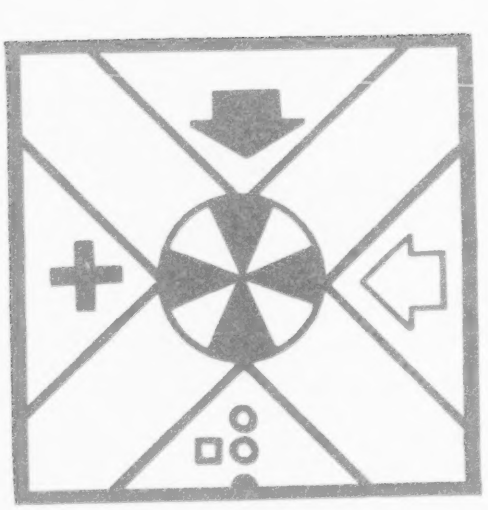
Exhibit 21 in the Appendix represents a synthesis of curriculum elements taken from materials produced by several states. It is suggested that advisory groups be utilized to determine appropriate subject content for local programs. Based on surveys and interviews with experienced school bus drivers, in-service training should focus on problems encountered by drivers, role playing, case studies, and specific needs of experienced drivers.

Summary Statements: There is a demonstrated need for new school bus drivers to perfect skills unique to the operation of a school bus before they are permitted to transport students. Learning activities should be conducted under close supervision and guidance so that student drivers may reach the required level of proficiency in handling of school buses. Problems should be developed to simulate special conditions which drivers encounter or which may be causing a disproportionate number of accidents. Student drivers should be evaluated upon their overall ability to handle vehicles under the complex conditions found on school bus routes.

There is also a critical need for systematic in-service school bus driver education and training. The school bus driver's ability to perform as an expert should be periodically evaluated. This evaluation should include a check of the driver's attitude toward other users of the highway, traffic laws, and basic defensive driving rules.

There is a trend for state divisions of vocational and technical education to be asked to assist in planning, organizing, and conducting programs of instruction for school bus drivers. The need for intra-agency cooperation and relationships is essential to effective school bus safety programs.

Materials relative to school bus driver education and training are available in various forms from state departments of education. Although most of these materials are not designed for teaching, much of the contents may be adopted for instructional purposes.



ACCIDENT SITE
INVESTIGATOR

The U.S. Department of Transportation is supporting programs directed at reducing the "crash initiation factors" which result from deficiencies in the roadway and driving environment. An effective detection program, based on a thorough analysis of accident occurrence and casual factors, leads to appropriate measures for correcting these deficiencies. The number of future accidents can be greatly reduced by continued evaluation of the effectiveness of roads and streets improvements at hazardous locations and continuing surveillance of all roadways to locate and correct potential accident locations.

Accident site investigation reports are normally recorded by personnel who are employed by local and state police departments, highway departments, city engineering divisions, and insurance companies. These reports have provided a singularly important cornerstone for traffic research and highway improvements in the past. However, investigation by police traffic personnel normally does not result in an intensive investigation of why highway accidents occurred. Therefore, it is necessary that accident site investigators be trained to report accidents and define and re-define their causes. Accident site investigators, with proper education and training, will supplement the task now being performed by accident site investigation units in law enforcement agencies and highway and engineering departments.

Manpower Requirements: There are presently less than 1,000 highly skilled accident site investigators employed on a full-time basis in the United States. It has been estimated that approximately 6,000 accident site investigators and accident site investigator aides will be needed at the state level in 1977. Approximately 12,000 accident site investigators and accident site investigator's aides will be needed at the local (city and county) level in 1978. These figures represent full-time equivalents, and do not necessarily imply that this limited number of people will be employed on a full-time basis. Rather, many more than this number may perform other traffic safety functions while devoting part of their time to accident site investigation.

Description of Accident Site Investigator: The accident site investigator is responsible for: analyzing and interpreting information on dangerous locations; investigating contributory factors in accidents; experimenting in traffic control devices and in traffic flow changes; preparing plans for traffic pattern changes and for new traffic controls; maintaining a cross-reference system of accident data; retrieving data concerning vehicles, drivers, accident locations, etc.; identifying and analyzing peripheral information relating to accidents; selecting (or ranking) which of many accident locations should receive top priority for expenditures; preparing recommendations, diagrams, and engineering documents for officials with influence for bringing about change; and evaluating the effectiveness of improvements as they are made. The traffic accident site investigator will likely be required to perform more routine tasks following traffic accidents, such as protecting the scene of accidents from further collisions, interviewing principals and witnesses, and photographing the accident scene.

Depending upon the needs of the community, the duties of the accident site investigator may represent only a portion of the total work load. Persons employed in this position will likely be assigned other traffic safety responsibilities.

Existing Programs: Departments of vocational and technical education in community-junior colleges, technical institutes, and area vocational schools have provided a limited amount of instruction in highway accident site investigation. This instruction normally has been in the form of courses or units which are part of the total curriculum in certificate or associate degree programs in law enforcement and police science or highway engineering technology. It is evident that these programs could be expanded to include additional learning activities in accident site investigation. Special certificate or associate degree programs focusing primarily on accident site investigation may be needed in larger urban areas. There is a growing need for the public education sector to provide seminars, workshops, and other in-service activities for accident site investigation groups from government, business, and industry.

Program Curricula: A limited number of curriculum materials in accident site investigation are available from state highway patrol academies, local police departments, and community-junior colleges (through law enforcement-police science programs). Many state and local agencies (other than public schools) have conducted training in accident site investigation. Published and non-published information about these efforts are on hand in most of these agencies. However, most of these materials are fragmentary and lack substantive elements needed in developing and expanding occupational education programs in public education institutions. These materials could be collected, organized, and prepared in meaningful sequence, as necessary, by program planners and instructors.

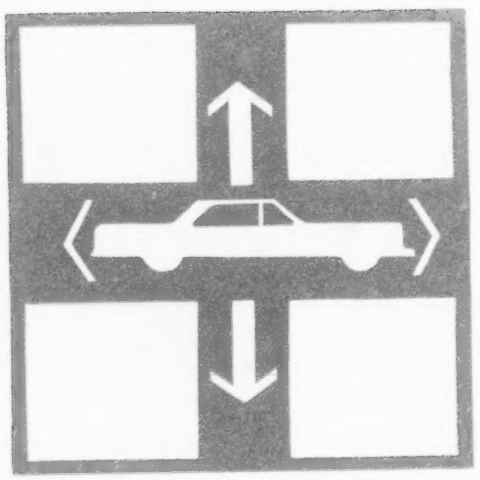
A course guide for training accident site investigators will be available from the National Highway Traffic Safety Administration in late July, 1971. This

guide, prepared under contract by Battelle Memorial Institute, Columbus, Ohio, is intended to deal with who investigates, what is involved in the investigation, the levels at which accident investigations are conducted, accident data, and who uses accident data. This material is prepared for local and state police departments, state highway personnel, city traffic engineering departments, junior colleges, and universities. The guide includes an outline of subject elements for training accident site investigators, as well as alternative ways of preparing personnel for the investigator position.

The California Highway Patrol Academy (1970) prepared a manual designed to supplement classroom instruction for accident site investigators and to serve as a reference for investigators in the field. An outline of topics included in this manual are shown in Exhibit 22 in the Appendix. An instructor's guide in traffic accident investigation is available from the North Carolina Department of Community Colleges (1969). This material, which was developed by the Wilmington (North Carolina) Police Department, provides for 30 hours of instruction. Community-junior colleges and technical institutes in North Carolina have used this guide to provide specialized training for employed law enforcement personnel as part of a two-year associate degree curriculum. Booz, Allen and Hamilton, Inc., (1968) and the Stanford Research Institute (1969) have made initial efforts to determine the scope of accident site investigation, the duties required of accident site investigators and accident site investigator's aides, and special training necessary for entry and advancement in the field. Selected segments of these efforts are presented in Exhibits 23, 24, 25 and 26 in the Appendix.

Summary Statements: The detection of hazardous roadway conditions has brought about limited success in reducing highway accidents, concomitant injuries, and property damages. Greater effort is needed in precluding future accidents by predetermining which are possible accident locations and in altering and correcting conditions at the locations through surveillance, study, and analyses. Locations known to be hazardous often receive immediate priority for repair, but long-range programs are needed which will result in prediction of hazardous highway locations and their correction. There is a critical need for specially trained accident site investigators.

A limited number of curriculum materials which relate to accident site investigation training are available. Other materials are forthcoming which will contain substantive elements needed to plan and conduct training programs in public educational institutions.



DRIVER EDUCATION
INSTRUCTOR AND AIDE

It is estimated that the human element is responsible for 80-85 percent of all traffic accidents. Driving responsibilities and skills have increased as the highway transportation system has become more complex and crowded.

Most authorities believe driver education and training contributes to traffic safety. The number of driver education programs in public and private educational institutions has grown rapidly in recent years. Since 1933, driver education in the public schools has increased from one program to approximately 14,000 public schools enrolling almost 2 million students. Refresher courses for chronic violators of traffic laws and courses for senior citizens are sponsored by public educational institutions. Commercial driver education and training schools have long been a primary source for gaining proficiency-level knowledge and skills in driving. There are approximately 2,200 commercial schools in operation in the United States, excluding truck and bus driver training schools. It is estimated that 1¾ million people receive instruction each year in commercial driver education and training schools.

This growth has been particularly marked since the end of World War II. Many outstanding individuals in the field of education have made valuable inputs into driver education, and are largely responsible for the quality of instruction offered today. These individuals are quick to point out, however, that further reforms will have to be made if driver education is to be a significant factor in keeping highways and streets safe for operators, motor vehicles, and pedestrians. It is clear that motorcycle education should be an integral part of traffic safety education, and such instruction is a responsibility of state departments of education and local school districts. The responsibility for training driver education teachers rests with institutions of higher learning. It seems logical that the responsibility for training driver education teacher aides should rest with those institutions now conducting other technical training.

Critics of driver education assess programs of instruction as poor countermeasures for the traffic accident problem. Such criticism may arise from the fact that qualified instructions and properly certified instructors and teachers have not been readily available to schools attempting well rounded driver education programs for youth and/or adults. In order to make public and private driver education courses more widely available, many feel it will be necessary to employ teacher's aides or auxilliary personnel to work under the guidance and direction of certified driver education teachers.

Manpower Requirements: To date, no figures are available concerning the number of driver education teacher's aides needed in the United States. Many states have not formulated plans for training or employing driver education teacher's aides. Several states are in the process of appraising existing driver education efforts to determine if reforms are feasible.

In 1969, 23,829 driver education teachers were employed in the United States. It has been revealed that more than 51,000 driver education teachers will be needed in 1978. In 1968, there were roughly 12,000 instructors employed by commercial driver education training schools in the United States. Manpower studies are needed in each state to determine which driver education programs could benefit by employing driver education teacher's aides.

Description of the Driver Education Teacher's Aides: A teacher aide position provides special assistance to secondary school driver education instructors and/or program coordinators at the local level. The driver education teacher's aide might be considered analogous to the position of a technician assigned to a professional engineer. Requirements would be the completion of a well defined curriculum in driver education, most likely at a community-junior college, and mastery of knowledge and skills to enable him to contribute to the success of the instructional program.

The duties of the teacher's aide would include assisting the professional teacher in: 1) collecting local accident data for presentation in the classroom, 2) gathering highway and traffic safety information from various resource materials, 3) preparing audio-visual aids for classroom instruction, 4) maintaining vehicle and simulation equipment used in skill-building exercises, 5) administering tests and evaluation procedures in the classroom and in the car, 6) preparing for and performing highway safety demonstrations in the classroom, 7) planning for guest lecturers from the community, and 8) maintaining records of students enrolled in driver education programs, and utilizing these records to evaluate effectiveness. Teacher's aides may be given preparation to instruct on a multi-car driving range, in a simulator, and in the classroom, in a limited capacity.

Existing Programs: Few driver education programs for training teacher's aides are known to exist. During 1968 and 1969, the Texas Education Agency implemented a program to train 113 driver education teaching assistants. Regular certified teachers (professional personnel) were prepared to be managers and supervisors for the programs in which teaching assistants are utilized. The course of study for training assistants was five weeks in duration; the course of study for supervisors, three weeks. Each group met for eight hours each day, five days a week to receive instruction for new and expanded roles in driver education. The Texas Education Agency is in the process of testing the hypothesis that non-degree personnel properly selected, trained and supervised, can be of valuable assistance in driver education programs.

New York and Pennsylvania are also utilizing paraprofessional personnel in public school driver education programs. In 1966, the State of Pennsylvania enacted legislation which permitted public school districts to employ teacher's aides in driver education. In order to qualify as teacher's aides, 12 credit hours of safety education, including driver education, at an accredited teacher training institution must be completed. Driver education teacher's aides are now employed in 17 school districts in Pennsylvania.

Inter-agency and Intra-agency Cooperation: Driver education and training programs for teacher's aides should link with state highway safety goals. It is es-

sential that the driver education specialist from state departments of education, local educational institution, and local governmental agencies work closely together in planning and implementing programs. It will be necessary to appoint advisory committees comprised of individuals from various agencies who have strong interests in driver education. These advisory groups will assist in determining essential requirements for training driver education teacher's aides and desirable prerequisites for enrolling in preparatory programs. Advisory groups can also assist in defining needs relating to instruction in driver education for traffic court referral cases, commercial schools, and adult driver education and training programs.

Job Mobility: The new thrust in highway traffic safety since the passage of the National Highway Safety Act of 1966 has created numerous job opportunities at various levels of skill and responsibility. Many of these jobs are in driver education or closely related areas. Some of the positions are in career ladder hierarchy, and advancement is through experience and/or additional training. Some students who complete a program for driver education teacher's aides may develop a sincere desire to continue their education in driver education at a four-year university. Another student in the same program may wish to transfer completed credits to a school which offers a program in highway engineering technology. Exposure to the field of driver education and traffic safety, either through educational experience or through on-the-job experience, may motivate students to seek job opportunities which are compatible to their interests and needs. These factors should be prime considerations in any occupational education program related to highway safety.

Program Curricula: State departments of education publish and distribute driver education curriculum guides used in conjunction with teaching secondary school driver education courses. Driver education materials are also available from drivers' clubs, insurance companies, state bureaus of highway safety, etc.

Because of its strong interest in the subject, the American Automobile Association has produced driver education teaching materials. The Automotive Safety Foundation, too, has long engaged in upgrading driver education and has recently developed new curriculum materials for teaching driver education courses. Textbooks, audio-visual materials, and other resources are available from commercial publishing houses.

The Human Resources Organization (1970) has examined the types of situations that typically confront automobile drivers, identified the appropriate driver behavioral responses, and determined what the driver should do in response to each situation. This analysis resulted in a set of 1,700 specific driving behaviors grouped in a hierarchy of tasks and sub-tasks. For each task, the driving task analysis includes a description of the appropriate driving behavior, indices of criticality, and related information about driver behavior. When completed, a set of instructional objectives based upon the task analysis will be available as a model for individual school systems. The task analysis is currently available to school systems.

Common curriculum elements to be considered in training driver education teacher's aides are listed in Exhibit 27 in the Appendix. Information on the following subjects can be obtained from various state agencies and educational institutions within the states: financing driver education programs; state driver education standards; organizing instructional activities; instructor qualifications; forms and record keeping for driver education; evaluating driver education programs of instruction; driver education facilities and equipment; placement of driver education in the school curriculum, including time allotment, and scheduling of students; and public relations for driver education programs.

An instruction outline for driver improvement is shown in Exhibit 28 in the Appendix. This material has been extracted from a guide published by the Wisconsin Bureau of Highway Safety Promotion (1970), Wisconsin Bureau of Motor Vehicles. Published as the official manual for traffic safety schools which provide special refresher training for traffic court referrals, the material contains inputs made by judges, prosecutors, educators, and legislators. The primary purpose of the Wisconsin Traffic Safety School is to provide a means for chronic traffic violators to better understand traffic responsibilities for the safety of themselves and others. The schools must be operated in full cooperation of the traffic courts. The traffic judge plays an important role in determining who can benefit from the school. Attendance may be compulsory. Wisconsin's schools of vocational, technical, and adult education are recognized as the logical and best equipped local agencies for establishing traffic safety schools.

A 100-hour course guide for training commercial driver school instructors has been developed by the Wisconsin Board of Vocational, Technical, and Adult Education (1970). This course guide resulted from Wisconsin legislative action making it mandatory that commercial driver school instructors satisfactorily complete a 100-hour course in driver and traffic safety edu-

cation in order to qualify for an instructor's license to teach students under 18 years of age. Exhibit 29 in the Appendix shows the objectives of this course, blocks of instruction, and time allotments.

Summary Statements: There is a national need to improve and expand driver education and training programs in public, private, and commercial schools. In order for this to be accomplished, many instructional personnel, including paraprofessional and auxiliary personnel, will need to be trained. To date, paraprofessional personnel and auxiliary personnel have not been widely used in public school systems.

Should more states deem it necessary to provide training for driver education teacher's aides, a careful student selection process must be implemented. Advisory committees comprised of individuals from varous highway safety disciplines can play an important part in bringing occupational education programs for teacher's aides into harmony with national and state driver education goals.

TRAFFIC PATROLMAN

The presence of traffic patrolmen on the nation's streets and highways increases attention to driving, reduces traffic violations, and reduces traffic accidents. Traffic patrolmen are essential in enforcing traffic laws, preventing traffic accidents, aiding highway accident victims, documenting the particulars of individual accidents, supervising accident cleanup, and restoring safe and orderly traffic movement following traffic accidents. Police traffic services are often functions of a total law enforcement effort. Traffic policemen are known by such titles as highway patrolmen, safety promotion officers, police traffic specialists, and accident investigation officers. They are employed at such levels, depending upon experience and training, as corporal, sargeant, lieutenant, captain, and traffic program specialist.

Manpower Requirements: In 1971, 37,000 patrolmen were employed by state traffic services departments. It is estimated that more than twice this number will be needed in 1977. There are approximately 100,000 traffic patrolmen employed at the city and county levels. Estimated manpower needs in 1978 at these local levels range from 127,000 to 365,000.

Demands for law enforcement services in areas other than traffic safety often create a shortage of manpower available for police traffic services. It is clearly evident that traffic patrolmen are needed in many urban areas to devote full-time attention to traffic safety.

Description of the Traffic Patrolman: Traffic patrolmen include personnel on foot, in automobiles, or on motorcycles (day-time or night-time) who maintain orderly traffic flow and enforce traffic and motor vehicle laws. The duties include: handling congested traffic problems; directing traffic at pedestrian crossings; directing and re-routing traffic at scenes of traffic accidents or construction sites; providing various kinds of services to traveling motorists; conducting routine driver license and motor vehicle inspections; conducting initial traffic accident investigations to determine the seriousness of the accidents, and to determine the need for additional traffic safety services; and investigating parking and moving traffic violations. The duties of the traffic patrolman may also include: in-depth studies of the positive factors in highway and street accidents; recognizing and reporting seriously hazardous highway and street conditions; testifying in traffic courts; commanding and directing the work of certain units of noncommissioned patrolmen, such as post-accident cleanup; operating speed measuring devices to enforce traffic laws; making medical inquests into the extent and nature of accident injuries; and interrogating drivers and witnesses at accident scenes.

Commissioned and noncommissioned traffic patrolmen will be called upon to perform many of these tasks. The noncommissioned traffic patrolman provides support to commissioned traffic patrolmen and is not normally assigned duties which conflict with his education and/or experience. By virtue of individual ability and through experience and/or education, the commissioned traffic patrolman is assigned duties and responsibilities that require more significant investigation, reporting, and presentation of accident information and data upon request. Specialists, such as accident site investigators, may be responsible for accident investigation activities requiring a high degree of knowledge and skills.

Existing Programs: The social pressures for more job status seem to be fostering an ever increasing demand for more strict educational requirements for entry-level positions in police services. To date, there are approximately 260 community-junior colleges and technical institutes offering programs leading to the associate degree in law enforcement or police science. However, very little emphasis is currently being placed on instruction in police traffic services. This stems from the increased societal pressures for more police services of a non-traffic nature.

In 1969, there were approximately 68,000 students enrolled in law enforcement training in public educational institutions. Approximately 40,000 of this number were enrolled in post-secondary programs. Adult supplementary programs accounted for 20,000 of this number.

There is a great potential for public educational institutions to become more involved in training traffic patrolmen. Existing programs in law enforcement and police science often include one or two courses in traffic as part of the total curriculum. With slight modification, these programs can make options available for students to specialize in a number of law enforcement areas, including traffic safety.

A state law enforcement consultant and a specialist in law enforcement education and training are employed by the Ohio Trade and Industrial Education Section, Division of Vocational Education (Ohio State Department of Education) to coordinate law enforcement training activities in the state. Programs of instruction are conducted by local vocational schools upon request of local police chiefs and sheriffs. Instructors for these programs are selected by police chiefs and sheriffs and trained by the state law enforcement consultant. To date, approximately 300 instructors are available for teaching basic and advanced courses at regional and state law enforcement institutes in Ohio.

Many post-secondary educational institutions are adopting an "open-door" enrollment policy. Any individual who has a vocational commitment and wants to develop knowledge and skills in a vocation may enroll in a vocational or technical program. This is significant in terms of new careers for sub-professionals, particularly the disadvantaged student. Aspects of the police traffic services career-ladder that pertain to increasing levels of job responsibility, status, and pay are directly linked to occupational education.

Inter-agency Cooperation: There have been problems, e.g. civil service regulations and attitudes of agency personnel and clients, associated with developing and expanding new occupational education programs related to law enforcement. Public educational planners must advance the concept that job ability or performance and job advancement is

related to occupational education pursuits. Vocational education planners must be certain that the knowledge and skills taught in programs will serve as a springboard for advanced employment in police traffic services. Formal occupational preparation and on-the-job training and supervision should allow for continuous career development. Incentives for employed personnel to enroll in in-service training programs must be present within the agency employing traffic policemen. Effective communications between public educational agencies and institutions and law enforcement agencies can go a long way in overcoming resistance to occupational education in police traffic services.

Program Curricula: Some research has been conducted by various agencies in an effort to determine the subject content necessary for adequately training police traffic services personnel. Fennessy (1968) reported that training standards for police traffic services were inadequate in both law enforcement agencies and post-secondary educational institutions. The training programs investigated varied greatly in duration, with the programs offered by law enforcement agencies differing greatly from those provided by post-secondary educational institutions. Programs in post-secondary educational institutions generally provide a broad base of knowledge and skills in law enforcement, including several general education courses. It is usually anticipated that program graduates can find employment in a number of governmental and private agencies. On the other hand, the training programs offered by law enforcement agencies are designed for personnel already employed. The trainee is introduced to the knowledge and skills essential to task performance immediately upon employment. The formal training in law enforcement agencies is relatively short in duration, with much of the learning taking place through actual experience on the job.

Fennessy concluded that the needs of the agency responsible for traffic control functions must be carefully defined before well prescribed curriculum is designed. Complete job analysis of police traffic functions must be conducted. The primary concern of job analysis, according to Fennessy, should be to provide a sequenced, step-by-step descriptive profile of all tasks performed by police traffic services officers. The time consumption for tasks performed should be a prime concern of the analysis. Alternative traffic law enforcement techniques should be studied.

Exhibit 30 was developed in conjunction with Fennessy's findings and is intended to suggest the minimum subject requirements for a two-year associate degree program of instruction in police traffic services. It is desirable that each individual complete the appropriate requirements before actually entering police services. This would be followed immediately by training at a police training academy which would provide for a more complete and proper perspective into departmental rules, regulations, and rudimentary skills required for successful police work. A model for the police academy program is shown in Exhibit 31. Students completing post-secondary programs which provide instruction in these areas would not be required to take the police academy program since it is intended for all recruits who have not otherwise had such background education and experiences. These models make provisions for many more instructional activities in traffic control than customary.

Green and Schaeffer (1967) found that police services personnel in small urban areas have relatively little opportunity for extensive training. This is incompatible with the knowledge and skills base needed by the small town policeman or patrolmen who is required to perform many varied activities in law enforcement.

Green and Schaeffer also found that local determination of training programs produces a wide range of differences across the nation in curriculum practices. This, in turn, makes it difficult for those contemplating new training programs to determine what should be included in police training curricula and how training contents should be selected.

Crockett and Stinchcomb (1968) prepared a manual entitled *Guidelines for Law Enforcement Education Programs in Community and Junior Colleges.* This manual is directed toward assisting the administrator, supervisor, and instructor in meeting the total needs of modern law enforcement agencies at national, state, and local levels. Among other useful information, the manual suggests several possible curriculum patterns for consideration by community and junior colleges. Although the manual covers the entire field of law enforcement, curriculum patterns are presented which can be used for selecting alternate subject elements to be included in training programs for police traffic patrolmen. The materials include a suggested two-year associate degree curriculum, courses to be provided in a certificate program, and several of the more common subjects included in short courses, seminars and institutes designed to meet current needs of various law enforcement agencies.

Curriculum materials for law enforcement officers' training were developed by the Ohio Trade and Industrial Education Service, Division of Vocational Education, (Ohio State Department of Education) to meet the needs expressed by the Buckeye State Sheriff's Associa-

tion and the Ohio Association of Chiefs of Police for an effective training program. The materials were evaluated and authenticated for subject content by an advisory committee comprised of representatives of the Buckeye State Sheriff's Association, and the Ohio Association of Chiefs of Police. The curriculum materials are contained in an instructor's manual and a learner's manual (text).

Subjects which can be encompassed in training programs for police traffic patrolmen include: traffic problems in cities; traffic patrol functions; traffic law enforcement methods; accident investigation procedures; photography in accident investigation; highway traffic administrative procedures; and traffic court preparation. These subjects may be provided as separate entities, such as workshops, or combined to form a large body of curriculum, such as a two-year associate degree terminal program. The subjects may be introduced in a variety of instructional settings, e.g., cooperative work-study programs and simulated exercises.

Summary Statements: Minimum standards for training traffic patrolmen will be established in many states in the future. The need for preparatory and in-service training will be increasingly important to traffic patrolmen as the traffic problem becomes more complex. It is likely that traffic patrolmen will continue to be required to perform a broad range of tasks related to traffic safety, including providing emergency medical services, dealing with alcohol problems on highways, and assisting in post-accident cleanup. The increasing demand for traffic patrolmen to perform activities outside the field of highway safety often leads to a serious neglect of highway and street traffic control. The effectiveness of police traffic services must be increased by more professionalized training of personnel.

Whether long-term training programs (e.g. associate degree or equivalent) in police traffic services is needed often depends upon local and state needs. It is clearly evident that most associate degree programs in law enforcement do not provide a comprehensive coverage of police traffic services. The acceleration of urbanization and the subsequent increase of crime seems to account for this. The public is demanding

streets that are safe from crime rather than free from potential automobile accidents.

The Omnibus Crime Control and Safe Streets Act of 1968 established the Law Enforcement Education Program (LEEP). For the first time, student-learner awards in law enforcement were made possible. Many post-secondary educational institutions have participated in LEEP to provide opportunities for professional training in law enforcement to those already employed in law enforcement agencies, as well as to those seeking careers in law enforcement. Increasing numbers of youth and adults are enrolling in law enforcement programs. It is essential that instruction in police traffice services be recognized as an important element in the total law enforcement education and training effort.

PEDESTRIAN SAFETY
PROGRAM SPECIALIST

The number of pedestrian fatalities on the highways and streets in the United States is rising, despite efforts to control these kinds of accidents. This is partly due to increasing urban growth, mounting motor vehicle registrations, and the increase of motor vehicle travel where large concentrations of pedestrians work and play.

During the early days of motor vehicle travel, the pedestrian seemed forgotten in traffic planning and traffic control. Yet, in 1937 four of ten persons killed in traffic were pedestrians, and in the urban areas the figure was a stunning 8 of 10. All laws and traffic regulations were primarily concerned with the needs of the driver and his motor vehicle. Since that period, alert groups and individuals have become increasingly interested in pedestrian safety programs and in implementing traffic laws and highway and street standards relative to the pedestrian. Many communities have developed outstanding pedestrian safety programs. Annual pedestrian fatalities were actually reduced from 16,000 in 1947 to 8,000 in 1959. However, in the late 1960's the figure began to climb. Today approximately 2,500 youngsters under 15 years of age are killed in pedestrian accidents each year in the United States. Over 80,000 are injured. Adults over 65 years of age account for 2,500 pedestrian fatalities and 11,000 injuries each year.

It is recognized that pedestrian safety must be an integral and constant element in all aspects of highway transportation and community planning. Individuals from kindergarten through adulthood should be exposed to pedestrian safety education. It is incumbent upon the states to train highway safety specialists who will have broad responsibilities in pedestrian safety.

Manpower Requirements: It is questionable whether a large number of personnel will be employed as full-time pedestrian safety program specialists in the future, or if pedestrian safety will remain as one function of a wide range of duties and responsibilities in several highway safety occupations. At the local level, traffic engineering technicians, highway engineering technicians, accident site investigators, and driver education instructors may devote much attention to pedestrian safety work. Program specialists, crossing guard supervisors, and crossing guards may work full-time in pedestrian safety. However, no specific manpower estimates for pedestrian safety program specialists are available.

Approximately 14,000 crossing guards were employed by law enforcement agencies, school systems, etc., in 1969. It is estimated that 195,000 crossing guards may be needed in 1978.

Description of Pedestrian Safety Specialist: Regardless of whether the pedestrian safety specialist works in one of several occupational areas or is employed in a distinct pedestrian safety position, the duties and responsibilities include many of the following activities: supervising crossing guards who direct traffic while pedestrians cross streets and highways; recording information on the nature and causes of pedestrian accidents; assisting in planning pedestrian safety education for youth and adults; assisting traffic engineering departments in developing drawings, specifications, and recommendations based upon pedestrian accident data; assisting in drawing up local pedestrian safety regulations; and assisting in drawing up standards relative to pedestrian safety.

Existing Programs: In the past, most state and local governments have not considered pedestrian safety a separate program. To date, neither high schools nor community-junior colleges have been extensively involved in training personnel for distinct roles in pedestrian safety. However, some instruction in pedestrian safety has been provided through law enforcement programs. The instruction usually focuses upon the supervision of pedestrian safety laws and ordinances and how to enforce them. In the engineering technology curriculum in community-junior colleges, consideration has been given to expanding instruction in engineering practices relative to pedestrian safety (e.g., traffic control devices such as lined crosswalks, foot bridges, pedestrian tunnels, sidewalks, and barriers).

Curriculum planners should appraise other existing programs to determine if instruction in pedestrian safety is needed. For example, occupational programs in retailing could accommodate instruction related to the design of parking lots and control of pedestrian crossing and sidewalks around shopping centers. Transportation programs related to physical distribution may provide instruction in pedestrian safety. Instruction in pedestrian safety may have application in hotel-motel management training.

All agencies responsible for pedestrian safety should be brought together to plan training programs and to preclude duplication of courses. Vocational planners should take account of immediate needs and future expectations and provide flexibility in training to adjust to both.

Program Curricula: One of the fundamental factors which contributes to the success of occupational education programs is quality curriculum guides. There is a need for curriculum materials in pedestrian safety which can be used in a variety of occupational programs in highway safety. Ideally, a "core" course

should be designed with built-in flexibility for utility in training personnel concerned with different functions and activities in pedestrian safety. This material might be used in training pedestrian safety program specialists in police traffic services, traffic engineering, and driver education.

Materials relative to pedestrian safety are available on a piecemeal basis from several sources. Two sources, the National Safety Council and the American Automobile Association, have long been alert to the need for community action programs in pedestrian safety. Subsequently, they have produced numerous materials concerning the engineering, education, and enforcement aspects of pedestrian safety. Textbooks in the areas of traffic and highway engineering, police traffic supervision, police traffic law enforcement, and driver instructor education contain units relative to pedestrian safety. These are available from a number of commercial publishing houses. Such materials will assist curriculum developers in conceptualizing the area of pedestrian safety and in preparing appropriate training materials.

Summary Statements: If the present pedestrian fatality rate is to be reduced or stablized, traffic safety program specialists are needed to work in local pedestrian safety programs. The need for pedestrian safety education programs is particularly acute for children under 15 years of age and adults over 65 years of age.

The scope of pedestrian safety spans several common occupational areas including driver education, traffic engineering, and police traffic services. Pedestrian safety is often considered to be a function within these occupational areas. Vocational education planners will benefit from organizing advisory committees to assist in planning and developing training programs and in gaining knowledge of community needs relative to pedestrian safety training.

DRIVER LICENSE
EXAMINER

The purpose of licensing motor vehicle drivers is to improve the quality of driving and thereby reduce the number of accidents and increase the efficiency of traffic flow. The urgent nature of the national problems in highway traffic reinforces the need for examining all motor vehicle drivers to insure that only persons physically and mentally qualified are free to drive. At the same time, it is necessary to prevent arbitrary denial of the right to drive.

Someone needs to be in a position to know the skills, knowledge, and attitudes of persons applying for driver licenses. It is recognized that driver licensing activities will not achieve the desired results without a sufficient number of capable driver license examiners.

Manpower Requirements: Driver license examining is generally accepted as a state employment position. In 1968, almost 5,000 persons were employed as driver license examiners. The estimated manpower needs in 1977 vary from 7,000 to 18,000. Either of these figures represents a substantial increase in manpower needs over a period of ten years.

Description of the Driver License Examiner: The driver license examiner administers written, oral, and driving tests to determine if applicants are qualified to drive. Specific duties include: evaluating the applicant's ability to distinguish different shapes and types of traffic control devices, and the meaning of shapes, colors, etc., in relation to highway safety; determining the applicant's degree of familiarization with natural laws (forces of nature) and man-made laws, regulations, and ordinances governing the safe operation of motor vehicles; assessing the applicant's understanding of responsibilities as a motor vehicle operator during emergency situations; evaluating the applicant's driving skills, observing emotional maturity, self-control, driving attention, and psycho-motor reactions to natural laws, man-made laws, regulations, and ordinances; arranging for remedial driver education for persons deficient in traffic knowledge and skill; and evaluating the applicant's medical records, and attesting to physical impairments.

The driver license examiner may also collect fees and issue instruction permits and licenses; supervise and instruct other driver license examiners; lecture before school and community groups concerning driver improvement programs; and compile information for improvements of highway laws and regulations.

Existing Programs: To date, public educational institutions have not trained driver license examiners on a wide scale. In isolated cases, some instruction has been provided through law enforcement programs in community-junior colleges. Driver license examiners are trained by various governmental agencies. The training is usually a part of the broad curriculum provided for all law enforcement personnel. In some cases, specialized training is provided upon assignment to a driver license agency.

There is strong support from many driver licensing agencies for more stringent training for examiners. Many law enforcement agencies are formulating long-range plans to require preparatory college study for all potential law enforcement officers. If these plans are implemented, existing programs in public educational institutions will need to be expanded or revised to meet the need for training driver license examiners. Such programs should be structured to permit refresher and in-service training as necessary.

Vocational and technical education must assume the role of an auxiliary unit with special expertise for occupational training as an ingredient of the total driver licensing campaign. However, the overall administration and supervision of the campaign will be under the control of the driver licensing agency. It will be necessary for all concerned with driver licensing and driver license examining training to provide inputs to such programs aimed at increasing highway safety. Physicians may be required to assist in preparing driver license tests and examinations. Traffic court personnel should be called upon to assist in developing training materials related to driver licensing.

Program Curricula: Existing materials related to driver education and law enforcement may contain subject elements related to driver license examining. Curriculum materials directly related to driver license examining may be acquired from state agencies conducting training programs in this area.

Driver license examining training materials developed under contract with the U.S. Department of Transportation are to be available in August, 1971. These materials will assist in organizing and managing programs of instruction at community-junior colleges, area vocational schools, technical institutes, and various governmental agencies involved with driver licensing. It is anticipated that the materials will be adopted in several programs of instruction across the United States in the near future.

Booz, Allen and Hamilton, Inc., (1968) and the Stanford Research Institute (1969) have delineated the duties of driver license examiners and the training and experience necessary for entering the occupation. These guidelines are presented in Exhibits 32 and 33 in the Appendix.

Subjects to be considered for inclusion in a driver license examining curriculum are listed in Exhibit 34 in the Appendix. The list is not in sequential order. These subjects relate to entry-level knowledge and skills required of driver license examiners. In-depth learning activities will need to be provided for upgrading employed driver license examiners.

Summary Statements: More effective and meaningful driver license examining must be provided by the states. Prior to licensing, all drivers should be tested to determine their driving performance and their knowledge of the laws, rules, and ordinances essential to traffic safety. Driver license examinations should be profitable educational experience for all driver license applicants. Well-trained driver license examiners are needed to test and evaluate potential motor vehicle operators, and to reexamine motor vehicle operators at regular intervals.

There is a need to involve physicians, traffic courts, law enforcement personnel, traffic engineers, and other groups and individuals concerned with traffic safety in identifying a "core" of knowledge and skills needed by the driver license examiner. Curriculum materials should be developed which are based upon national and state specifications regarding driver license examining. Procedures peculiar to individual states can be identified by an analysis of the task to be performed by driver license examiners.

OTHER HIGHWAY
SAFETY OCCUPATIONS

National manpower surveys have identified other highway safety functions in which there presently exists a manpower shortage or where a shortage is likely to occur in the near future. A limited number of public educational institutions are offering occupational training programs closely related to these occupations. If existing and emerging manpower needs are to be met, vocational and technical education planners must analyze manpower needs in these areas and expand occupational education to accommodate the manpower requirements. An order of training priority should be formed with respect to state and local needs and employment opportunities.

Computerized Speed Detection Training: Various types of computers are used by law enforcement agencies to detect and apprehend speeding motorists. There is an increasing need to provide formal instruction to develop technical skills essential for the operation of these devices.

A course in computerized speed detection offered by the North Carolina Department of Community Colleges includes four hours of classroom instruction and a field demonstration of equipment. This is followed by a thirty-day practice period including field instructional sessions and written examinations. Students are entitled to a field certification test upon passing a written examination. The field certification test consists of clocking violating vehicles in various clocking configurations. A passing score on the field certification test entitles a student to a certificate of competency in the operation of the type computer for which the program was designed. Courses of instruction in radar operation are also being conducted in various public schools in North Carolina.

Training for Motorcycle Operators, Motorcycle Inspectors, and Motorcycle Driver License Examiners: As the number of motorcycles in operation has increased greatly in recent years, so has the number and variety of motorcycle accidents. Motorcycle driver education and examination is needed to protect motorcycle operators and passengers and all users of the highway transportation system. Operating a motorcycle requires some knowledge and skills unique to operating other types of motor vehicles, and the procedures for examining and licensing motorcycle operators differ from other type motor vehicle inspection.

Vocational-technical education planners at the state and local levels should determine if their states require motorcycles to be inspected by a certified inspection mechanic, how many inspection stations exist, how much time mechanics devote to motorcycle inspection activities, and how many trained inspection mechanics are needed. This in-depth study can be applied to motorcycle licensing manpower requirements. Vocational and technical education facilities and resources should be provided in training motorcycle safety specialists. Vocational-technical education departments may wish to sponsor motorcycle safety workshops for motorcycle dealers.

Motorcycle safety curriculum planners may obtain materials from the Metropolitan Life Insurance Company, the National Safety Council, the American Association of Motor Vehicles Administrators, and the American Automobile Association.

The Traffic Institute of Northwestern University (1964) developed an instructor's manual for training motorcycle riders. Two accompanying publications, a manual for motorcycle riders and a motorcycle operator's evaluation instrument, are also available. The National Commission on Safety Education, National Education Association (1969), has developed guidelines and policies for motorcycle education in public educational institutions. This material is designed for responsible state department of education officials, local school administrators, and institutions concerned with motorcycle driver education, including the preparation of driver education teachers and teacher's aides.

Wrecker Operators and Other Debris Hazard Control and Cleanup Personnel: Many accidents are caused from debris remaining on the highway following traffic accidents, e.g., vehicles, barriers torn from

the roadway, spilled gasoline and chemicals. Rocks, ice, and snow that remain on the highway while traffic is moving is also a hazard. Debris is a major cause of congestion on streets and highways. Likelihood of chain-reaction accidents increases where roadway lanes are blocked or restricted by debris. It is essential that trained personnel be available to provide prompt restoration of traffic at accident scenes and to remove all types of debris from the streets and highways.

Accident site investigators, traffic patrolmen, firemen, ambulance drivers, and wrecker operators often are called upon to remove debris from the highway. Adequate numbers of these personnel must be trained to operate salvage equipment effectively, extract trapped persons from wrecked vehicles, remove hazardous fuel and chemicals from the roadway, detour approaching traffic drivers, and restore orderly traffic flow.

The manpower needs of debris hazard control and cleanup are greatest for wrecker operators. Such persons are employed by the states or by local garages and service stations. There is a need to provide training activities for personnel already employed. Such training would necessarily be conducted with full support and cooperation of the employers of wrecker operators. Upgrading training should be conducted periodically to provide the latest hazard control and cleanup techniques.

Curriculum materials for wrecker operator training need to be developed. Existing materials in the area of accident investigation have some application to wrecker operations, including pre-scene activities, emergency medical services, etc. Curriculum materials in automobile body and fender repair relate to the mechanics of extricating trapped persons from wrecked vehicles. Since wrecker operators may be called upon to perform minor service and repair tasks on stalled or partially disabled vehicles, materials relative to automotive service and repair have some application to wrecker operations. Curriculum materials relative to handling hazardous materials at the scene of accidents are desperately needed for programs in debris hazard control and cleanup.

Advisory committees composed of persons involved in debris hazard control and cleanup functions should be called upon to assist in developing training materials.

Traffic Record Analysts: Adequate traffic records permit highway safety officials to utilize traffic facts in recognizing "safety breakdowns," trends, and deviations from the normal. Traffic records aid in highway safety research, highway improvements, driver education, periodic motor vehicle inspection, traffic courts, and improvements in police traffic services.

Trained traffic records specialists, including analysts, are needed to develop and maintain traffic record systems which will lend support to rapid encoding, storage, retrieval, summary, analysis, and dissemination of traffic facts. Modern computerized traffic records networks are emerging which will necessitate both training new personnel and providing in-

service training to employed personnel. Electronic data processing operators and clerical personnel are also needed to work full-time in traffic records. An increasing number of trained personnel are needed in supervisory and administrative positions. Duties required of most of these personnel involve compiling figures, collecting facts, and transferring, systematizing, and distributing traffic information.

Vocational and technical education can interface with the states' traffic records systems by utilizing the information available through the systems to determine manpower needs in the area of traffic records. A complete and functional traffic records system yields facts upon which manpower development decisions may be based. Furthermore, these data can help vocational and technical planners explain training needs to the public.

Job definitions are needed for personnel working in traffic records. The analysis, scope of each "job," and specific tasks to be assigned to specific personnel need to be delineated.

Few occupational education courses are currently being taught that relate specifically to traffic records. An appraisal of existing law enforcement and police science programs, and business and office occupational programs may indicate that an optional specialty in traffic records would be meaningful and appropriate. Local and state vocational and technical education planners should be alert to opportunities to participate in surveys to determine which specific traffic records occupations require a significant degree of highway safety training and to opportunities to participate in developing training guidelines and manuals for traffic records personnel.

Traffic records personnel training should be appriate for records departments of motor vehicle inspection divisions, driver licensing bureaus, motor vehicle registration agencies, highway and traffic engineering departments, law enforcement agencies, and traffic courts. There are numerous supportive occupations which link with traffic records.

PROGRAM IMPLICATIONS

Vocational and technical education has been challenged to maintain, extend, and improve existing programs and to develop new programs so that persons of all ages and all communities have ready access to high quality training or retraining that is realistic in the light of actual or anticipated opportunities for employment and suited to the needs, interests, and abilities of those participating in such training. Vocational and technical education planners are challenged to look beyond the status quo and deal with a rapidly changing world of work.

The United States currently faces the paradox of large numbers of unemployment and underemployment existing side-by-side with urgent shortages of manpower in expanding public service occupations. National studies have indicated that there is a rapid expansion of occupations and functions in the field of highway safety.

The role to be played by vocational-technical education in meeting future manpower requirements in highway safety is still evolving. The extent of involvement will depend upon the accelerated demand for highly skilled workers based upon technological developments and national and state legislation relative to highway safety. New and redefined occupations are often slow to emerge. Manpower projections are often difficult to make since a new occupational title will likely only be a function associated with a total job. Therefore, it will be necessary to expand existing programs and provide specialized programs in new and emerging occupations as the employment opportunities become clearly identified.

The relative newness of most highway safety occupations and functions creates some problems in classifying and reporting programs of instruction in public educational institutions. New occupational titles are not included in the latest edition of the *Dictionary of Occupational Titles*, issued by the U.S. Department of Labor. Program titles and code numbers are not included in the program classification manual developed by the U.S. Office of Education because program classifications are based on titles described in the *Dictionary of Occupational Titles* and existing occupational education programs in public educational institutions. Efforts are under way to develop a taxonomy of new and emerging occupations. Until such a taxonomy has been developed and new program titles and code numbers included in the program classification manual, it will be necessary to provide specific information in reports to the U.S. Office of Education to properly characterize programs.

Present informal and casual training arrangements in highway safety areas are likely to become increasingly inadequate as sources of work skills. As occupations become increasingly complex, formal training is likely to become more essential. The cost for training in highly skilled occupational areas will be high. These costs will be still higher for employers to provide training and supportive services to upgrade present employees with limited educational backgrounds to these higher level occupations.

Vocational and technical education can and should be a major partner in the national highway safety program. Vocational educators have proven that they are able to make community and area analyses of manpower needs, conduct job analyses, and interpret these job analyses to curriculum and instructional plans. Vocational and technical education has the resources and services that business, industry, and governmental agencies need in order to keep their personnel at a high level of capability.

Use of Advisory Committees: The use of advisory committees is crucial to successful and meaningful occupational education in highway safety. Advisory groups can assist vocational and technical education planners in identifying the occupational needs of the highway safety industry; focusing public attention on these needs; planning programs of instruction; providing learning resources for student trainees; providing placement services for program graduates; and evaluating and modifying programs of instruction. The advisory committee will be most effective when it consists of an appropriate mix from management and the skilled or technician levels of people for the respective area within highway safety.

Determining Manpower Needs: In order for public educational institutions to be responsive to occupational needs, manpower data must be accumulated from appropriate agencies. This data will likely reveal several occupations within the area of highway safety requiring common functions. Some functions will be found in supportive highway safety occupations. When functions have been identified, specific cognitive, affective, and psycho-motor skills necessary for each function can be determined. Through task analysis it will be possible to determine the level of skills required, including general acquaintanceship, performance, or abstraction (ability to direct others in the performance and management of these skills). This will mininize the possibility of overtraining highway safety personnel. Once the skill requirements have been determined, it will be possible to structure a curriculum focused on providing occupational experiences necessary to perform the job, including the total immersion of the students in simulated and/or actual and diverse work situations (Cooperative Education) to reinforce learning. This will require strong support from both governmental and private agencies and firms.

Vocational and technical education planners must determine what knowledge and skills can be taught through formal education in contrast to what can be learned on-the-job. It must be determined if the traditional internal promotion system, from basic to career to supervisory work, can be broken and opportunities provided at the skill and responsibility level at which the graduates are trained.

Each community should appraise the potential manpower that is presently qualified to work in various highway safety areas. This should include positive identification of those who are truly available for existing openings, and those who are not willing to assume

a job if it means that they must move to another location. The difference between manpower requirements and manpower available establishes training needs. It is important that these training needs be projected for five to ten years in the future.

Determining Resource Requirements: A knowledge of training needs permits identifying training resources needed. Training resources include facilities, equipment, supplies, instructors, and potential students. Vocational and technical education planners will need to determine the kinds of resources needed, when they will be needed, and when they will be available. This will include appraising the existing programs to see if these resources are currently available and how long it will take to get them. It often takes many months to develop a new program to the point of actually enrolling students.

Determining Training Priorities and Goals: A careful planning process that utilizes the expertise of state and local advisory committees, state directors of vocational and technical education, and governors' highway safety manpower coordinators will result in identifying training goals in highway safety. These training goals should be stated in short-and long-range plans. Strong ties should be established with public and private agencies to assist with planning programs and working cooperatively to provide various kinds of services for trainees. Occupational education programs in some of the new and emerging fields of highway safety should be established on a pilot-test basis. Such programs will permit other schools to share in the experience and information gained from exemplary programs.

Curriculum Alternatives: A wide range of opportunities are available for vocational and technical education planners to provide occupational education relative to highway safety.

1. Programs: Generally, three categories of programs exist—two-year associate degree (usually technical level) programs, specialist programs, and vocational programs. Only one program per state may be needed. A cluster of several highway safety areas may be included in one program. Occupational education programs to train highway safety specialists may be two-year or similar level programs for selected occupations. Length of these vocational programs may vary considerably, i.e., three months, six months, one year, or two years in duration.
2. Courses: Existing occupational programs may take a highway safety direction with the addition of one, two, or three courses related to highway safety.
3. Units: Specific knowledge and skills, comprising a unit, may be added to a course.
4. Clinics, workshops: These types of instructional activities include adult preparatory and refresher instruction in given areas of highway safety.
5. Information: Information may be made available for all highway safety instructional activities from kindergarten through adult continuing education programs, courses, units, clinics, and workshops.

Highway and traffic safety can and should be an integral part of many existing programs in vocational and technical education. For example, units or courses relative to pedestrian control and street and parking lot design can be incorporated into retailing curricula. Chemical tests for alcohol contents may be introduced in nursing or medical laboratory technology programs. Instruction in traffic control devices can be introduced into electrical technology curricula. Consumer and home economics programs may include units concerning the purchase of automobiles and the economic and safety factors related to their maintenance. Agricultural education programs should provide instruction in horticulture as it relates to the landscaping of highways and streets for safety purposes, and in safety measures essential to driving slow-moving farm vehicles.

The variety and extent of possible instructional activities which can be offered through vocational and technical education is limited only by imagination, amount of funds available, and national and state priorities.

APPENDIX

EXHIBIT 1

EMERGENCY MEDICAL TECHNICIAN—AMBULANCE*

I. Objectives and Scope of Course

II. Course Outline
- A. The emergency medical technician (EMT)
  - 1. EMT role
  - 2. EMT responsibilities
  - 3. EMT equipment
- B. Airway obstruction and pulmonary arrest
- C. Mechanical aids to breathing and pulmonary resuscitation
- D. Cardiac arrest
- E. Bleeding, shock and airway care, practice, test and evaluation
- F. Pulmonary resuscitation and cardiopulmonary resuscitation practice, test and evaluation
- G. Wounds
- H. Fractures of the upper extremity
- I. Fractures of the lower extremity
- J. Injuries to the head, face, neck and spine
- K. Injuries to the eye, chest, abdomen, pelvis and genitalia
- L. Medical emergencies
  - 1. Poison
  - 2. Snake bite
  - 3. Heart attack
  - 4. Stings
  - 5. Stroke
  - 6. Asthma
  - 7. Diabetes
  - 8. Acute abdominal problems
  - 9. Communicable diseases
- M. Childbirth and problems of child patients
- N. Lifting and moving patients
- O. Environmental emergencies
- P. Extrication from automobiles
- Q. Operations
  - 1. Driving an emergency vehicle
  - 2. Maintaining a safe and ready vehicle
  - 3. Records and reports
  - 4. Communications
  - 5. Procedures at hospital emergency rooms
- R. Responding to an ambulance call
- S. Test and evaluation
  - 1. Written
  - 2. Skills practice

III. Course Requirements
- A. Scheduling
- B. Class size
- C. Course coordinator
- D. Lesson instructors
- E. Students
- F. Facilities
- G. Material and equipment
- H. Visual aids
- I. Required texts and supplementary references

IV. Conducting the Course
- A. Using the lesson plan
- B. Aiding student learning
- C. Maintaining records
- D. In-hospital training

V. Course Coordinator Orientation

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* Selected from Dunlap & Associates, Inc. *Basic Training Program for Emergency Medical Technician—Ambulance.*

EXHIBIT 2

CURRICULUM ELEMENTS IN PERIODIC MOTOR VEHICLE INSPECTION

I. Records to be Obtained
   A. Class of vehicle
   B. Date of inspection
   C. Make of vehicle
   D. Model year
   E. Vehicle identification number
   F. Defects by category
   G. Identification of inspector
   H. Milage or odometer reading

II. Components to be Inspected
   A. Brake lines, service brake system, emergency brake system, and parking brake system
   B. Steering and suspension systems
   C. Tire, wheels, and rims
   D. Lamps, reflective devices, and associated equipment
   E. Glazing
   F. Windshield wiping, washing, defrosting, and defogging
   G. Horns, rearview mirror
   H. Body, doors, fenders, molding, and bumpers
   I. Fuel supply system
   J. Exhaust system
   K. Wheel nuts, wheel discs, and hub caps
   L. Directional signal devices
   M. Transmission and power trains
   N. Instrument panel lights
   O. Speedometer

EXHIBIT 3

MOTOR VEHICLE INSPECTOR*

Scope

Includes all state employees who perform actual inspection of motor vehicles, their supervisors, and the director of the motor vehicle inspection program.

Duties

Performs actual inspection of motor vehicles including motorcycles and school buses. Supervises subordinate personnel in the inspection of motor vehicles, or plans and directs the inspection program.

Entering Education

High school graduate or the equivalent.

Entering Experience

A minimum of three years experience as an automobile mechanic.

Special Training

- A minimum of 40 hours preservice training in the techniques and procedures of conducting a motor vehicle inspection and in report preparation.
- A minimum of 80 hours on-the-job training under the supervision of a senior motor vehicle inspector. Supplementary in-depth training, to the extent feasible, for supervisory personnel.
- A minimum of 16 hours in-service training annually for the purpose of reviewing preservice training and of examining new developments in the motor vehicle inspection field.

* Selected from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower, Appendix B (5).*

EXHIBIT 4

MOTOR VEHICLE INSPECTOR*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline
Course Description	No. of Hours	Course Description	No. of Hours	Engineering
A. The Techniques and Procedures of Conducting a Motor Vehicle Inspection and Preparing Reports.	30	A. A Review and Examination of New Developments in the Motor Vehicle Inspection Field.	16 YR.	100

*Selected from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University-Level Institutions*, Vol. I, p. 8.

EXHIBIT 5

CHEMICAL TESTS FOR ALCOHOL*

I. Applied Mathematics and Science
  A. Mathematics—Review
  B. Metric System
II. Pharmacology and Physiological Effects of Alcohol
  A. History and types of chemical tests for alcohol in blood
    1. Separation of alcohol from body fluids
    2. The measurement of alcohol in body fluids
  B. Alcohol and the Human Body
    1. Beverage alcohol
    2. Absorption of alcohol
    3. Distribution of alcohol
    4. Elimination of alcohol
    5. Accumulation of alcohol in the body
    6. Widmark's hypothesis
    7. Alcohol tolerance
  C. Effect of Alcohol on Body Organs
    1. Skin
    2. Gastrointestinal tract
    3. Heart and circulation
    4. Liver and kidneys
  D. Effects of Alcohol on the Central Nervous System
    1. The brain
    2. Vision and hearing
    3. Muscles
    4. Judgment and self-control
III. Background and History of Chemical Testing
  A. Previous international "works" in the chemical test field
  B. Development of chemical testing instruments

*Selected from North Carolina State Board of Education, Department of Community Colleges. *Chemical Tests for Alcohol Program.*

EXHIBIT 5—con't.

CHEMICAL TESTS FOR ALCOHOL

IV. Theory of the Breath Test Instrument
- A. Nomenclature and function
- B. Operational procedure
- C. Collecting the sample
- D. Passing the sample through the instrument
- E. Maintenance of the breathalyzer
  1. Preventive maintenance
  2. Common failures
  3. Corrective action

V. Legal Issues of Breath-Alcohol Testing
- A. State law governing intoxicating liquor and driving under the influence
- B. State law governing chemical tests
  1. Presumptive level
  2. Implied consent
- C. State Board of Health rules and regulations
- D. Rules of evidence
- E. Constitutional issues
- F. Supreme Court decisions
- G. Expert witnesses
- H. Independent tests
- I. Advising defendent of results
- J. Certification of chemical test equipment operators

VI. Supervision of Chemical Test Program
- A. "Selling" program
- B. Preparation for court
  1. Chemical supply
  2. Calibration of the instrument
  3. The need for outside experts
- C. Standard operating procedures
  1. Conditions for which subject may be arrested
  2. Procedures for arresting
  3. Procedures after arresting subject
  4. Procedure following test
  5. Special situations

VII. Laboratory Instructions and Practice
- A. How to operate breath test instruments
  1. Introduction to breath test instruments
  2. Terminology
  3. Operation procedure
- B. Breath-alcohol simulator
  1. History
  2. Operation of simulator
  3. Formula for mixing simulator solutions
- C. Practice
  1. Running known solution in breath alcohol simulators
  2. Test for garlic, onions, and acetone
- D. Supervised laboratory with drinking subjects
  1. Instruction as to laboratory project with drinking subjects
  2. Performance of various physical and mental tests by drinking subjects, before drinking
  3. Drinking of prescribed quantity of alcoholic beverages
  4. Testing of drinking subjects
  5. Performance of various physical and mental tests by drinking subjects, after drinking
  6. Plotting blood-alcohol curve of drinking subjects
  7. Summary and review of laboratory project
- E. Laboratory examination—running unknown simulator solutions

VIII. Drugs in Relation to Highway Safety

EXHIBIT 6

BREATH EXAMINER SPECIALIST*

Scope

Consists of Police Traffic Services Patrolmen qualified to administer breath tests at a field unit headquarters.

Duties

Administers breath tests to individuals suspected of driving under the influence of alcohol. Operates and maintains examining equipment. Testifies, as required in court, and reports on activities.

Entering Education

High school graduate or the equivalent.

Entering Experience

A minimum of four years as a Police Traffic Services Patrolman or the equivalent.

Special Training

- A minimum of 40 hours preservice training in the background of the highway safety program, in alcohol in relation to highway safety, in operation and maintenance of test equipment, in courtroom testimony, and in report writing.
- A minimum of 16 hours annual in-service training devoted to review of preservice training and to examination of new developments within the alcohol program.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. I, Appendix B.

EXHIBIT 7

BREATH EXAMINER SPECIALIST*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline		
Course Description	No. of Hours	Course Description	No. of Hours	Law	Public or Bus. Admin.	Police Science
A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Alcohol Program.	16 YR.	25	50	25
B. Courtroom Testimony Regarding Alcohol Problems in Highway Safety	5					
C. Report Writing in Connection with Alcohol Problems in Highway Safety.	5					

* Extracted from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University-Level Institutions*, Vol. I, p. 10.

EXHIBIT 8

ENGINEERING TECHNOLOGY EDUCATION CURRICULUM SUMMARY IN CREDIT HOURS*

CURRICULUM SUBJECT ELEMENTS	CREDIT HOURS
Basic Science Courses	
Mathematics	10
Physical Sciences	9
	19
Nontechnical Courses	
Communications	6
Humanistic-Social Studies	9
	15
Technical Courses	
Technical Skills	6
Technical Specialities	32
	38
TOTAL CREDIT HOURS	72

* Selected from Dobrovolny. *Civil Engineering Technology Consultants' Workshop*, p. 19.

EXHIBIT 9

CIVIL ENGINEERING TECHNOLOGY CURRICULUM*

Highway — Option

Hours per week for 16-week semester

COURSE TITLE	Class	Lab.	Outside Study	Total	Cr. Hrs.
FIRST SEMESTER					
Materials (chemistry and properties)	2	3	4	9	3
Technical drawing	1	7	4	12	4
Technical mathematics I	5	0	10	15	5
Technical physics (mechanics)	3	2	4	9	3
Communication skills	3	0	6	9	3
Highway and structural technology seminar+	1	0	2	3	0
	15	12	30	57	18
SECOND SEMESTER					
Construction methods and equipment	3	0	6	9	3
Mechanics (statics and dynamics)	3	0	6	9	3
Surveying and measurements	2	6	4	12	4
Technical mathematics II	5	0	10	15	5
Technical physics II	3	2	4	9	3
	16	8	30	54	18

* U.S. Department of Health, Education and Welfare, Office of Education. *Civil Technology: Highway and Structural Options*, p. 8.

+ Italicized words refer to subjects more nearly related to highway safety.

EXHIBIT 10

CIVIL ENGINEERING TECHNOLOGY CURRICULUM*

Highway -	Option Hours per week for 16-week semester				
COURSE TITLE	Class	Lab.	Outside Study	Total	Cr. Hrs.
THIRD SEMESTER					
Advanced drafting (highway)	1	7	4	12	4
Industrial organizations and institutions**	3	0	6	9	3
Soils and foundations+	2	3	4	9	3
Strength of materials	3	2	6	11	4
Technical reporting	2	0	4	6	2
Photogrammetry	1	3	2	6	2
	12	15	26	53	18
FOURTH SEMESTER					
Drainage and geology	3	3	6	12	4
Reinforced concrete construction	3	2	6	11	4
Roadway design and construction	3	4	8	15	5
Route design and surveys	2	4	4	10	3
Legal and economic aspects of engineering	2	0	4	6	2
	13	13	28	54	18

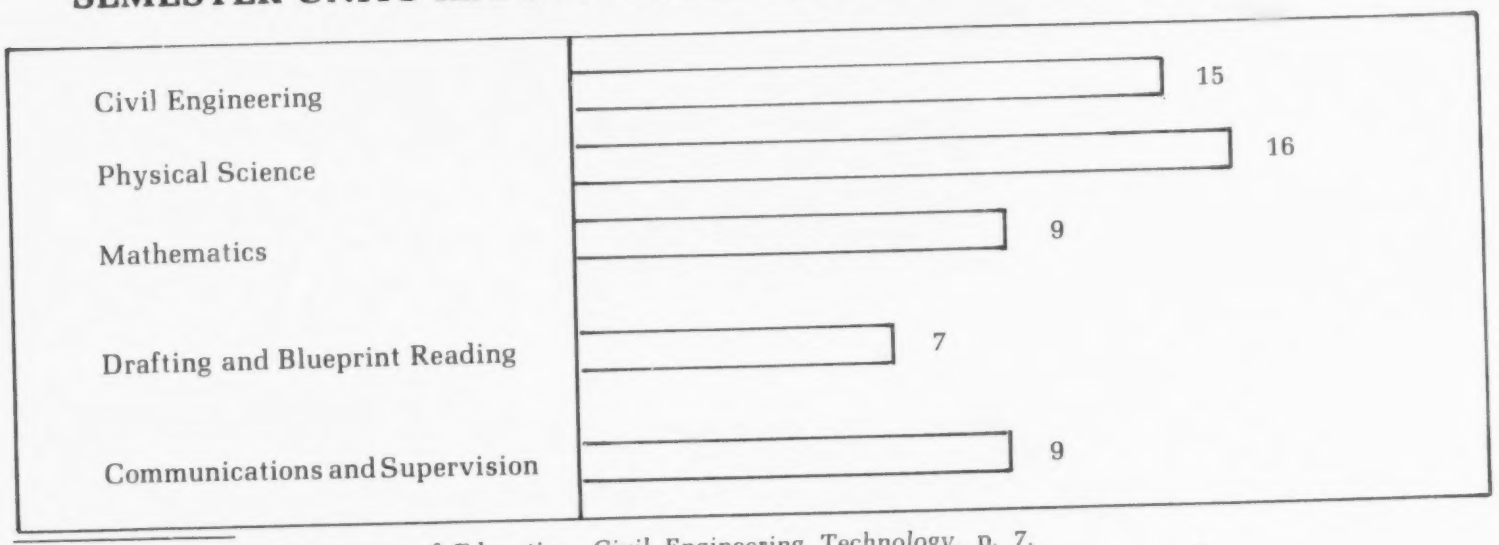
* U.S. Department of Health, Education and Welfare, Office of Education. *Civil Technology: Highway and Structural Options*, p. 8.

** General and industrial economics (three-hour class) may be chosen as an elective instead of industrial organizations and institutions.

+ Italicized words refer to subjects more nearly related to highway safety.

EXHIBIT 11

CIVIL ENGINEERING TECHNOLOGY SEMESTER UNITS RECOMMENDED FOR CERTIFICATE PROGRAM*



*California State Department of Education. *Civil Engineering Technology*, p. 7.

EXHIBIT 12

ENGINEERING AIDE—SAFETY*

Scope

Includes all technically trained aides to highway engineers involved in unique safety aspects of the design, construction, and maintenance of highways.

Duties

Under supervision of a highway engineer, performs technical duties related to the safety aspects of location, design, construction, and maintenance of highways, bridges, and other highway structures.

Entering Education

High school graduate with courses in mathematics, or the equivalent.

Entering Experience

A minimum of three years experience in the technical activities of a state highway department or the equivalent.

Special Training

- Upon appointment, a minimum of 40 hours training at the junior college level devoted to obtaining a general knowledge of the highway safety program.
- Upon appointment, if not previously obtained, a minimum of 80 hours of training at the junior college level devoted to acquiring the skills required to perform technical duties in the safety aspects of highway design, construction, and maintenance.
- A minimum of 24 hours in-service training annually in order to review previous training and to examine new developments in design, construction, and maintenance within the context of the highway safety program.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. I, Appendix B (26).

EXHIBIT 13

ENGINEERING AIDE—SAFETY*
ENTRY AND REFRESHER TRAINING CURRICULA

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline	
Course Description	No. of Hours	Course Description	No. of Hours	Public or Bus. Admin.	Engineering
A. General Knowledge of the Highway Safety Program	40	A. A Review and Examination of New Developments in Design, Construction, and Maintenance within the Context of the Highway Safety Program	24 YR.	33	67
B. The Impact of the Highway Safety Program on Highway Design, Construction, and Maintenance	80				

* Selected from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University Level Institutions*, Vol. I, p. 12.

EXHIBIT 14

ELEMENTS OF HIGHWAY PLANNING*

UNIT 1: FUNDAMENTALS OF HIGHWAY PLANNING

I. Determining Needs for New or Improved Roads
  A. Inventory of roads
  B. Studies of traffic volume and classification of roads
  C. Traffic analyses
    1. Average annual daily traffic (AADT)
    2. Design Hour (DH)
  D. Traffic forecasting
  E. Geometrics

II. Determining Location of Roads
  A. Mapping
  B. Origin and destination studies
  C. Economic analysis
  D. Route location

III. The Relation of Highway Planning to Other Types of Planning
  A. Community planning
    1. Planning board
    2. Planning staff
    3. Duties
    4. Coordination
  B. Regional planning
    1. By public agency
    2. By a quasi-public agency

UNIT 2: STATE HIGHWAY AGENCIES AND SYSTEMS

I. State Highway Agencies
  A. Public agencies
    1. State department of transportation, highway safety administration
    2. State highway department
    3. United States Department of Transportation
    4. County agencies
    5. Township agencies
    6. Municipality agencies
  B. Quasi-public agencies (transit authorities, etc.)

II. State Highway Systems
  A. Highways receiving federal aid
    1. Primary highways
    2. Secondary highways
  B. Special kinds of primary highways
    1. Interstate
    2. Arterials
    3. Expressways
    4. Parkways
  C. Highways not receiving federal aid
    1. State system
    2. County system
    3. Town roads
    4. City and village streets
  D. Quasi-public highways

III. Coordination Among Highway Agencies

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* Taken largely from The New York State Education Department. *Program for Highway Technicians: Unit IV, Elements of Highway Planning*, pp. 1-106.

EXHIBIT 14—con't.

ELEMENTS OF HIGHWAY PLANNING

UNIT 3: ROAD INVENTORY AND FIELD SCORING

I. Inventory of Roads
  A. Elements of the inventory
    1. Length of roads
    2. Width of roads
    3. Type of paving
    4. Development of surrounding areas
  B. Use of inventory data
II. Field Scoring
  A. Surface and structural condition
  B. Maintenance condition
  C. Relation of volume to capacity
III. Sufficiency Ratings
  A. Averaging field scores
  B. Index and number
  C. Engineering judgement

UNIT 4: MAPPING AS A PLANNING TOOL

I. Kinds of Maps
  A. Planimetric maps
    1. Highway planning series (HPS) county maps
    2. Highway planning series city maps
    3. Travel guides and atlases
    4. Sandborn maps
    5. Photo maps
  B. Photogrammetric maps
  C. United States geological survey maps
    1. Functions of U.S. geological survey maps
    2. Updating maps
  D. Aerial photo maps
II. Uses of Maps
  A. Planimetric maps
    1. Highway planning series (HPS) county maps
    2. Highway planning series city maps
    3. Travel guides and atlases
    4. Sandborn maps
    5. Photo maps
  B. Photogrammetric maps

UNIT 5: TRAFFIC STUDIES

I. Volume Counts of Traffic
  A. Machine method
    1. Fixed detectors
    2. Portable detectors
    3. Printed tape records
    4. Punched-tape recorders
    5. Computer control
  B. Manual methods
II. Origin and Destination Surveys
  A. Roadside interview
    1. Spot survey

ELEMENTS OF HIGHWAY PLANNING

2. Survey screen
3. Cordon around area

B. Other origins and destination surveys

III. Classification Counts
A. Comprehensive data collection
B. Short-term count

IV. Turning Count

V. Uses of Traffic Surveys

UNIT 6: TRAFFIC ANALYSIS

I. Analysis of Traffic Flow
A. Average annual daily flow of traffic (AADT)
B. Design Hour (DH)
C. Composition of traffic

II. Analysis of Travel Characteristics
A. Origin and destination (OND surveys)
B. Assignment of traffic through bypass
1. Diversion curve
2. Variation from the curve

III. Application of Traffic Analysis
A. Approving existing routes
B. Planning the bypass

UNIT 7: TRAFFIC FORECASTING

I. Principles of Traffic Forecasting
A. Selection of forecast period
1. Ten-year forecast
2. Twenty-year forecast
3. Thirty-year forecast
4. Forecast for a longer period

B. Obtaining traffic figures for the base year
1. Declining trend
2. Static trend
3. Upward trend

C. Extension factors influencing forecast
1. Normal traffic
2. Generated traffic
3. Development traffic

D. Computation for forecasting

II. Uses of Traffic Forecasts

UNIT 8: GEOMETRICS AND DESIGN STANDARDS

I. Factors Affecting Design Standards
A. Traffic volume
B. Terrain characteristics
C. Developed areas

II. State Geometric Standards
A. Standards for expressways
1. Rural expressways
2. Urban expressways

ELEMENTS OF HIGHWAY PLANNING

B. Standards for rural highways
C. Standards for urban arterials

III. Selection of Geometrics

IV. Introduction to Advanced Design Standards

UNIT 9: ROUTE LOCATION

I. Differences Between Highway Planning Preliminary Engineering
   A. Determining the corridor
   B. Determining the route

II. How to Select the Corridor

III. How to Determine the Route Location
   A. Review of the route-study
   B. Use of photogrammetric maps
   C. Use of reconnaissance
   D. User-benefit analysis
   E. Revision of economic analysis
   F. Route-location report

UNIT 10: HIGHWAY SAFETY

I. Accent on Safety
   A. The federal safety program
   B. The state program for highway safety

II. The U.S. Department of Transportation Safety Crusade
   A. Updating safety standards
   B. Spot improvement of unsafe conditions

III. Standard Safety Measures
   A. Road markings
   B. Signs for safety
   C. Traffic signals and devices

UNIT 11: HIGHWAY LAW

I. State Highway Laws

II. The Law-Making Process
   A. Reason for changes in laws
   B. Drafting, submitting and introduction of bill to legislature

III. Details of Highway Laws
   A. Court interpretations
   B. Changes made in laws

IV. Other Laws Related to Highways
   A. State laws
   B. Federal laws

UNIT 12: INTRODUCTION TO URBAN TRANSPORTATION PLANNING

I. Evolution of Urban Transportation Planning
   A. Finding minimum travel time
   B. Method of finding minimum travel time

EXHIBIT 14—con't.

ELEMENTS OF HIGHWAY PLANNING

II. Mathematical Models
  A. Terminology
    1. Node
    2. Link
    3. Route
    4. Tree
  B. Gravity model
  C. Intervening opportunities model
  D. Competing opportunities model
  E. Special purpose model
III. Fundamentals of Urban Transportation Planning
  A. Approaches
    1. Cordon system
    2. Screen-line system
    3. Land-use
  B. Techniques in the land-use system
    1. Trip generation
    2. Trip distribution
    3. Traffic assignment
  C. The plan

EXHIBIT 15

HIGHWAY DESIGN AND ESTIMATING*

1. Introduction
2. Sequence of Design (Phase 1)
3. Highway Classification
4. Features of Design
5. Horizontal Alignment (Control of Curvature)
6. Horizontal Alignment (Superelevation Runoff)
7. Elements of Horizontal Alignment
8. Vertical Alignment (Criteria and Controls)
9. Typical Sections and Standard Structure Sheets
10. Geometric Auxiliaries
11. Sequence of Design (Second, Third, and Fourth Phases)
12. The Engineer's Estimate
13. Report on Design and Estimate

*Extracted from The New York State Education Department. *Program for Highway Technicians: Unit VI, Highway Design and Estimating*, p. v.

EXHIBIT 16

HIGHWAY DRAWING*

UNIT 1: THE HIGHWAY PLAN

I. The Highway Plan
  A. Purpose
    1. Detailed drawings
    2. Detailed notes
  B. Highway design
    1. Terrain, soil, drainage and right-of-way variation factors
    2. Standard sheet
  C. Highway plan divisions
    1. Specified divisions (16)
    2. Significance of divisions to the small project

II. Divisions of Plans
  A. Cover sheet
    1. Title of project
    2. Corner insert
    3. Approval and recommendation
    4. Design staff
    5. Location maps
    6. Design data
      a. The design classification of the highway
      b. Projected traffic count
  B. Index sheet
  C. Table of maintenance
  D. Small-scale key map
  E. Typical sections and general notes
    1. Purpose
    2. Scales used in sections
    3. Defining sections between certain stations
    4. Section description of the items to be used in the construction
    5. Specialized conditions
  F. Miscellaneous tables
  G. Delineator details
  H. Drainage structures
  I. Miscellaneous details
  J. Roadside development
  K. Parking areas
  L. General large-scale plan
  M. Profiles
  N. Lighting and traffic control signals
  O. Bridges
  P. Standard sheets

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* Taken largely from The New York State Education Department. *Program for Highway Technicians: Unit II, Highway Drawing*, pp. 102-110.

EXHIBIT 17

TRAFFIC ENGINEERING TECHNOLOGY CURRICULUM*

Course Title	Class Hours	Lab Hours	Semester Credit
FIRST YEAR			
FIRST SEMESTER			
Introduction to traffic engineering	1	3	2
Engineering drawing	1	6	3
Technical mathematics I	4	0	4
Technical physics I	3	3	4
Communication skills	3	0	3
Physical education	0	2	1
	12	14	17
SECOND SEMESTER			
Principles of traffic administration and safety	2	0	2
Graphics	1	6	3
Technical mathematics II	4	0	4
Technical physics II	3	3	4
Communication skills	3	0	3
Physical education	0	2	1
	13	11	17
SECOND YEAR			
THIRD SEMESTER			
Field traffic surveys	3	3	4
Control devices	3	0	3
Geometric design	3	3	4
Statistics	3	0	3
Social science (govt., soc.) elective	3	0	3
	15	6	17
FOURTH SEMESTER			
Traffic studies	3	3	4
Traffic laws and regulations	3	0	3
Urban transportation planning	3	3	4
Data processing	2	3	3
Social science (govt., soc.) elective	3	0	3
	14	9	17
Totals	54	40	68

* Extracted from Koert. *Traffic Engineering Technician Programs in the Community College*, pp. 20-21.

EXHIBIT 18

ENGINEERING AIDE—TRAFFIC*

Scope

Includes all technically trained aides to traffic engineers involved in the traffic control devices program.

Duties

Under supervision of a traffic engineer, aids in performing technical duties related to the traffic control devices program, such as evaluating the overall program, executing engineering studies, obtaining and maintaining inventories of traffic control devices, and determining hazardous conditions through road patrols.

Entering Education

High school graduate with courses in mathematics, or the equivalent.

Entering Experience

A minimum of three years experience in the technical activities of a state highway department, or the equivalent.

Special Training

- Upon appointment, a minimum of 40 hours training at the junior college level devoted to obtaining a general knowledge of the highway safety program and its impact upon traffic operations and traffic control devices.
- Upon appointment, if not previously obtained, a minimum of 80 hours training at the junior college level devoted to acquiring the skills required to perform technical duties in the areas of traffic operations and traffic control devices.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. I, 1968.

EXHIBIT 19

ENGINEERING AIDE—TRAFFIC*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline	
Course Description	No. of Hours	Course Description	No. of Hours	Public or Bus. Admin.	Engineering
A. General Knowledge of the Highway Safety Program.	10	A. A Review and Examination of New Developments within the Highway Safety Program and Traffic Control Devices.	24 YR.	8	92
B. The Impact of the Highway Safety Program on Traffic Operations Activities and Traffic Control Devices.	30				
C. The Technical Duties in the Areas of Traffic Operations and Traffic Control Devices as Related to Highway Safety.	80				

* Selected from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University Level Institutions*, Vol. I, 1969, p. 13.

EXHIBIT 20

SUGGESTIONS FOR ORGANIZING A COURSE FOR SCHOOL BUS DRIVERS*

The following are suggestions for conducting a course for school bus drivers:

1. The selected meeting place should be accessible for participants.
2. No class should include more than 35.
3. The course should meet for at least 10 two-hour sessions or a minimum total of 20 hours.
4. A local school official should serve as general chairman in setting up the program.
5. School personnel with teaching experience should serve as instructors and preside at each meeting.
6. Teachers of high school driver education courses should assist in units which relate to driving skills and driving tests.
7. The school physician, school nurse, state police, sheriff's office, local police, head school bus driver, and the school bus mechanic should be consulted in planning the course.
8. Instructors should refer to and make use of the school business management news publication.
9. Five or six parents should be invited when the school bus driver's relationship to parents and pupils is taught. These parents should be notified in advance why they have been asked to attend and what contributions they may offer.
10. All new drivers should be required to take the course as soon as possible. Several schools in the area should be asked to contribute instructors and resources.
11. Men and women who plan to become either substitute or regular drivers should be encouraged to attend. Men teachers should be encouraged to take the course for possible school bus driving duties in case of emergencies, and the district superintendent and principals should attend to emphasize the importance of school bus driver training. The state education department should issue certificates upon completion of all course work.
12. A refresher course offered every year or two should emphasize; 1) the responsibilities of the school bus driver; 2) driver qualifications, including physical and psychophysical testing; 3) driving skills; 4) accidents, first aid, and school bus health and sanitation; and 5) traffic laws, signs, and signals.

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* Selected from The University of the State of New York, the State Education Department. *Manual for the Instruction of School Bus Drivers*, pp. 8-9.

EXHIBIT 21

SCHOOL BUS DRIVING
(A SYNTHESIZED OUTLINE OF CURRICULA ELEMENTS)

I. General Aspects of the School Bus Safety Program
  A. Overview of the school bus safety program
    1. Significance and scope
    2. Objectives and philosophy
    3. Administration
      a. State
      b. Local
    4. Agencies and institutions involved in the school bus safety program
      a. State education department
      b. Colleges and universities
      c. Secondary school systems
      d. Public safety departments
      e. Motor vehicle administration
      f. State and local police departments
      g. Other
  B. National trends in pupil transportation
    1. School transportation services
    2. School bus design
    3. School bus equipment
  C. The U.S. Department of Transportation's role in school bus safety

II. Driving Orientation
  A. Qualifications for school bus drivers
    1. Physical qualities
    2. Mental and emotional qualities
    3. Character traits and habits
    4. Eligibility rules for driver certification

SCHOOL BUS DRIVING

5. Driver licensing

B. School board responsibilities
C. School administrator's responsibility
D. School bus transportation supervisor's responsibility
E. School bus route layout
   1. Factors to consider in route layouts and schedule planning
   2. Factors to be considered in making time schedule
F. Requirements for extra-curricular or non-routine use of school bus
G. School bus driver reporting procedures

III. Pupil Control
   A. Pupil differences
      1. Physical
      2. Social
      3. Intellectual
      4. Emotional
      5. Environmental background
      6. Recognizing differences
      7. The special child
   B. Discipline and behavioral problems
      1. Pupils' responsibility to the school and the bus driver
      2. School bus driver's responsibility to pupils
      3. Characteristics of a well disciplined bus
      4. Accepted forms of disciplinary action
IV. Public Relations
   A. The school bus driver and the parents
   B. The school bus driver and school officials
      1. Board of Education
      2. Superintendent
      3. Principal
      4. School bus transportation supervisor
      5. Relationship with teachers
      6. Relationship with other bus drivers
   C. The school bus driver and the community
V. Driving
   A. Driving tests
      1. Physical
      2. Mental condition and personal habits
      3. Psychophysical
   B. Driving fundamentals
   C. Special driving conditions
   D. Traffic laws
   E. Traffic control devices
VI. Safety and Emergency Procedures
   A. Planning for emergency situations
   B. Where accidents may occur
   C. Causes of accidents
   D. Responsibilities of school bus drivers in case of accidents
   E. Emergency medical services
      1. Maintaining first aid equipment
      2. Obtaining emergency medical assistance in case of accidents
      3. First aid procedures
VII. School Bus Maintenance
   A. The driver and the maintenance program
   B. Areas of responsibility
VIII. State and Federal Pupil Transportation Rules, Regulations, and Specifications

EXHIBIT 22

ACCIDENT INVESTIGATION*

I. Vehicle Crashes
   A. Problems
   B. Solutions
II. Background on Accident Investigation
   A. Comparison of accident investigation to other types of police investigation
   B. Use of accident data
   C. Types of accident arrests
   D. Qualities of accident investigation personnel
   E. Terminology
   F. Types of accident investigations
      1. Normal
      2. Late-reported
      3. Hit-and-run
III. Accident Investigation Procedure
   A. Value of fixed procedure
   B. Protection of life and property
   C. Arrival at the scene
   D. Protecting the scene of the accident
   E. Administering first aid
   F. Gathering evidence
      1. Factors to consider
         a. The highway
         b. The vehicle
         c. The roadway
      2. Questioning the drivers and witnesses
      3. Checking drivers for physical and mental conditions (including intoxication)
      4. Examining the vehicle
         a. Determining damages
         b. Determining if proper safety devices are installed and operative
      5. Examining the surrounding physical conditions
         a. Holes in the road
         b. Debris on the pavement
         c. Driving visability
      6. Preparing sketches of the scene
      7. Taking photographs of the scene
   G. Causes of accidents
      1. Collision
      2. Non-collision
      3. Direct cause
      4. Mediate cause
   H. Enforcement action
   I. Hit-and-run investigation
   J. Witness and driver statements
IV. Determining Speed from Skid Marks

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* Selected from Department of California Highway Patrol, Office of Training Division. *Accident Investigation*, pp. 1-46.

EXHIBIT 23

ACCIDENT SITE INVESTIGATOR*

Scope

Includes all professional state employees who perform thorough investigations of accident sites, including personnel with either engineering or enforcement backgrounds.

Duties

Performs investigations of accident sites to collect data concerning causes of and factors contributing to accidents. Analyzes data and prepares recommendations for engineering and enforcement measures that might be enacted to reduce accidents and their effects. Provides supervision to accident site investigator aides.

Entering Education

Masters degrees in traffic engineering, bachelors degree in civil engineering, or a police traffic services officer educator.

Engineering Experience

A minimum of two years as a traffic engineer, four years as a highway engineer in design, construction, or maintenance, one year as a police traffic services officer, or the equivalent.

Special Training

Upon appointment, a minimum of one in-service university-level course providing general knowledge of the relationship of highway design, construction, maintenance, traffic operations, and enforcement to the prevention and reduction of accidents or the alleviation of their aftereffects. Also, one university-level course of a semester's duration in one of three areas of specialty (traffic operations, highway engineering, and enforcement) providing in-depth knowledge of the relationship between that specialty and the prevention and reduction of accidents or the alleviation of their aftereffects.

At least 40 hours attendance every three years in a university-level course to review previous training and to examine new developments within the field.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. 1, Appendix B.

EXHIBIT 24

ACCIDENT SITE INVESTIGATOR AIDE*

Scope

Includes all state-employed, technically trained aides to accident site investigators, including personnel with either engineering or enforcement backgrounds.

Duties

Under the supervision of the accident site investigators, aids in investigating accident sites in order to collect data concerning causes of and factors contributing to accidents. Assists in the analysis of data and preparation of recommendations for engineering and enforcement measures aimed at removing or reducing factors contributing to accidents and their effects.

Entering Education

High school graduate or the equivalent.

Entering Experience

At least three years of progressive, responsible experience in highway planning, surveys, design, construction, maintenance, operations, enforcement, inspection, laboratory, research, related fields, or the equivalent.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. I, Appendix B.

EXHIBIT 24—con't.

ACCIDENT SITE INVESTIGATOR AIDE

Special Training

Upon appointment, a minimum of 120 hours training at the junior college level, of which 40 hours should be devoted to obtaining a general knowledge of the highway safety program and of the relationship of highway design, construction, maintenance, traffic operations, and enforcement to the prevention and reduction of accidents. The remaining 80 hours should be devoted to acquiring the requisite technical skills for accident site investigation data collection and analysis.

A minimum of 24 hours in-service training for the purpose of reviewing previous training and examining new developments within accident site investigation.

EXHIBIT 25

ACCIDENT SITE INVESTIGATOR*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline		
Course Description	No. of Hours	Course Description	No. of Hours	Public or Bus. Admin.	Police Science	Engineering
A. General Knowledge of Relationship of Highway Design, Construction, Maintenance and Traffic Operations, and Enforcement to the Prevention and Reduction of Accidents or the alleviation of their aftereffects.	40	A. A Review and Examination of New Developments within Accident Site Investigation.	40 Tri.	5	25	70
B. In-depth Knowledge of the Relationship between Traffic Operation, Highway Engineering, or Enforcement and the Prevention and Reduction of Accidents or the alleviation of their aftereffects.	40					

*Selected from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University-Level Institutions*, Vol. I, p. 10.

EXHIBIT 26

ACCIDENT SITE INVESTIGATOR AIDE*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline		
Course Description	No. of Hours	Course Description	No. of Hours	Public or Bus. Admin.	Police Sciences	Engineering
A. General Knowledge of the Highway Safety Program	10	A. A Review and Examination of New Developments within Accident Site Investigation.	24 YR.	25	10	65
B. Relationship of Highway Design, Construction, Maintenance, Traffic Operations, and Enforcement to the Prevention and Reduction of Accidents or the Alleviation of their aftereffects.	30					
C. Accident Site Investigation Data Collection and Analysis in Connection with Highway Safety.	80					

*Selected from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University-Level Institutions*, Vol. I, p. 10.

EXHIBIT 27

COMMON CURRICULUM ELEMENTS IN DRIVER EDUCATION

1. Traffic laws (including application of these laws)
2. Traffic signs and symbols
3. Driver license examining
4. Motor vehicle driving skills
5. Driver attitudes, emotions and physical fitness
6. Natural laws affecting the operation of a motor vehicle
7. Construction and maintenance of motor vehicles
8. Environmental driving conditions
9. Perceptual skills and traffic strategy
10. Traffic engineering
11. Police traffic services
12. Consumer education (economic and safety aspects of purchasing and operating an automobile)
13. Emergency driving procedures

EXHIBIT 28

TRAFFIC SAFETY SCHOOL FOR DRIVER IMPROVEMENT*

OBJECTIVES

1. To teach knowledge concepts necessary for safe motoring.
2. To gain an understanding of the interrelationships between man and the motor car.
3. To understand the values of wholesome driver attitudes and the contributions one individual can make to improving our traffic safety performance in society.

I. Orientation and Preview
   A. Introductory film

II. Group Discussion
   A. Movie follow-up
   B. Discuss purpose of school
   C. Discuss driving records and violations of class members
   D. Traffic problems—local, state, national

III. Administer Driving Knowledge Quiz
   A. Suitable driver attitude film
   B. Score knowledge quiz
   C. Discuss knowledge quiz
   D. Group discussions on alcohol and driving
      1. Social values
      2. Psychological values
      3. Understanding reactions
      4. Legal aspects
      5. Driving responsibilities
      6. Control of one's faculties

IV. Attorney's Presentation
   A. Point system
      1. Revocation
      2. Suspension
   B. Probationary license
   C. Accident responsibilities
      1. Legal
      2. Moral
   D. Legal driving responsibilities
   E. Laws governing vehicle equipment

V. Question-and-Answer Period

VI. Laws, Ordinances and Enforcement
   A. Panel presentation and discussion with special police panel:
      1. Local police officer
      2. County enforcement officer
      3. State trooper

VII. Film on Defensive Driving

VIII. Discussion and Comments on Panel Presentation

IX. Question-and-Answer Period

X. Final Examination

XI. Group Discussion
   A. Test critique
   B. Course summarization
   C. Course evaluation

XII. Suitable Concluding Film

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* Selected from Wisconsin Bureau of Highway Safety Promotion, Division of Motor Vehicles. *Wisconsin Traffic Safety School*, pp. 8-9.

EXHIBIT 29

COURSE GUIDE FOR COMMERCIAL DRIVER SCHOOL INSTRUCTORS*

Objectives of Course: The course is intended to develop proficiencies in:

1. Evaluating and improving the individual's driving knowledge and skills.
2. Planning lessons for classroom and in-car instruction.
3. Utilizing basic evaluation techniques in classroom and in-car settings.
4. Interpreting forms and regulations related to commercial driver school operations.
5. Understanding and interpreting motor vehicle traffic laws.
6. Utilizing selected classroom instructional procedures and methods.
7. Utilizing selected in-car instructional procedures and methods.
8. Assessing individual personality characteristics associated with effective instruction of the adolescent.
9. Knowing the role and the resources of related traffic agencies.
10. Utilizing curriculum materials developed for commercial driving schools.
11. Selecting and utilizing appropriate instructional aids.
12. Knowing specific job requirements and individual responsibilities related to commercial driver school operation.

The course guide is comprised of the following subject matter elements sequenced according to the order shown (time allotments also given):

BLOCKS OF INSTRUCTION	TIME ALLOTMENT (Hours)
1. Classroom procedures and methodology	14
2. Commercial driver school curriculum	33
3. Evaluation and upgrading of driver performance	12
4. Evaluation of students	7
5. Lesson planning for classroom and vehicle	7
6. In-car procedures and methodology	12
7. Instructor qualities	1
8. Motor vehicle division regulations and forms	4
9. Motor vehicle traffic laws	4
10. Instructional aids	3
11. Resource agencies	1
12. Job requirements and responsibilities	2

* Selected from Wisconsin Board of Vocational, Technical, and Adult Education. *Commercial Driv— School Instructors: A Course Guide*, pp. 2-3.

EXHIBIT 30

MODEL TWO-YEAR POST-HIGH SCHOOL PROGRAM*

General education requirements (courses)	Professional course requirements (courses)
1. Communication arts and skills	1. Introduction to criminal justice administration
2. Political science	2. *Police organization*+
3. Introductory social science:	3. Field problems
Psychology	
Sociology	
Economics	
Social Problems	
4. History	4. Criminal law and procedure
5. Laboratory science	5. Evidence
6. Humanities	6. *Introduction to traffic services*
7. Physical development	7. *Investigation techniques*

Electives

1. *Supervisory techniques*
2. Introduction to administration and management
3. *Traffic collision investigation*
4. *Advanced first aid*
5. *Introductory statistics*
6. *Advanced investigation techniques*
7. *Traffic accident prevention and control*
8. *Purpose and objective of the transportation system*
9. Personnel evaluation

* Selected from Fennessy, *et al. Technical Content of State and Community Police Traffic Services Programs*, p. 321.

+ Italicized words refer to subjects more nearly related to police traffic services.

EXHIBIT 31

MODEL STATE TRAINING PROGRAM FOR RECRUIT PERSONNEL*

No.	Subject Area	Approximate hours
1	Introduction to Criminal Justice	9
2	Criminal Law and Procedure	25
	Crimes	
	Arrests (mechanics, legality)	
	Courtroom demeanor	
	Evidence	
	Search and seizure	
	Use of force	
3	Theory of Social Control	6
4	Criminal Investigation	30
	Techniques	
	Special problems	
	Scientific aids	
	Fingerprints	
	Evidence collection	
	Interviewing methods	
	Report preparation	
5	Communication Skills	30
	Technical writing	
	Sentence structure	
	Syntax	
	Spelling	
	Public speaking	
	Visual aids	
	Sketching	
	Report organization	

EXHIBIT 31—con't.

MODEL STATE TRAINING PROGRAM FOR RECRUIT PERSONNEL

6	Patrol Techniques *Preliminary investigation procedure+* *Patrol theory and responsibility* *Special problems and general techniques* Disorderly persons *Drunk driving* Domestic quarrels Mentally ill persons Prowler calls Crime scene procedure *Driver training and education* *Use of discretion and judgment in patrol* *Police vehicle operation*	40
7	Public Relations	6
8	Human Relations Understanding people Minority social problems	15
9	*Traffic Control* *Police traffic services* *Collision prevention and control:* *The role of enforcement* *Traffic law* *Principles of selective assignment* *Accident investigation and reporting* *Mechanics of citation* *Traffic direction techniques* *Protection of the collision scene:* *On-scene procedure*	40
10	Juvenile Procedures Theory of juvenile law Special techniques	6
11	Defense Tactics *Arrest techniques* Self-defense tactics Weaponless Weapon	15
12	Firearms Safety Weapons familiarization Discretion as to use	10
13	Firearms Proficiency	#
14	*First Aid*	20†
15	Examinations	8
	TOTAL:	260

* Selected from Fennessy, *et. al. Technical Content of State and Community Police Traffic Service Program*, p. 321.
\+ Italicized words refer to subjects more nearly related to police traffic services.
\# No time limit. Practice until proficient.
† Advanced certification by American Red Cross.

EXHIBIT 32

DRIVER LICENSE EXAMINER*

Scope

Includes driver license examiners and supervisors of the driver license examiner program.

Duties

Conducts the driving portion of driver license examination, including motorcycle and school bus operator examinations. Supervisory personnel direct and manage all aspects of the driver licensing program.

Entering Education

High school graduate or the equivalent.

Special Training

- A minimum of 80 hours of preservice training in the background of the highway safety and driver license programs, and in the techniques and procedures of conducting driver tests, including special vehicles such as motorcycles, and in report preparation.
- A minimum of two months on-the-job training under the supervision of a senior Driver License Examiner.
- A minimum of 24 hours annual in-service training devoted to reviewing preservice training and examining new developments.
- Supplementary in-depth training for supervisory personnel.

* Extracted from Booz, Allen and Hamilton, Inc. *Safety Specialist Manpower*, Vol. I, Appendix B.

EXHIBIT 33

DRIVER LICENSE EXAMINER*

Entry Training		Refresher Training		Percent of Total Training Hours by Discipline	
Course Description	No. of Hours	Course Description	No. of Hours	Public or Bus. Admin.	Psychology
A. The Background of the Highway Safety Program.	10	A. A Review and Examination of New Developments.	24 YR.	15	85
B. The Background of the Driver License Program.	10				
C. The Techniques and Procedures of Conducting Driver Tests, Including Special Vehicles Such as Motorcycles, and in Report Preparation.					

* Extracted from Stanford Research Institute. *The Feasibility of Establishing Highway Safety Manpower Development and Research Centers at University-Level Institutions*, Vol. I, p. 8.

EXHIBIT 34

DRIVER LICENSE EXAMINING

I. DRIVER LICENSE TESTS
- A. Vision test
  - 1. Visual acuity
  - 2. Color blindness
- B. Law test
  - 1. Natural laws
  - 2. Man-made laws
- C. Road test
  - 1. Signs and signals
  - 2. Turns and intersections
  - 3. Business and residential districts
  - 4. Parallel parking
  - 5. Stopping and starting on hills
- D. Preparing driver license applicants for test (instructions)
- E. Inspecting vehicle before road tests
- F. Measuring performance on the road driving tests
  - 1. Rating and scoring systems
  - 2. Satisfactory performance criteria
  - 3. Unsatisfactory performance criteria
- G. Handling failures
  - 1. Exercising tact
  - 2. Referring applicants to sources for assistance
- H. Problems of driving
  - 1. Accident frequency
  - 2. Significance of color blindness
  - 3. Reaction time
  - 4. Ocular dominance
  - 5. Hearing
  - 6. Blood pressure

II. Driver Licenses
- A. Types of licenses
- B. Maintaining and protecting licenses
  - 1. Renewal
  - 2. Loss of licenses
  - 3. Changing address
  - 4. License suspension
  - 5. License revocation
  - 6. Reexamination

III. TRAFFIC AND ACCIDENTS
- A. Practical traffic problems
- B. Traffic administration
- C. Accident investigation
- D. Evidence in traffic law enforcement

IV. THE LEGALITY OF DRIVER LICENSING
- A. Constitutionality of driver licensing
- B. Age restrictions
- C. Traffic laws
- D. Uniform motor vehicle code
- E. Court decisions affecting driver licensing privileges

V. FACTORS RELATING TO DRIVING
- A. Attitude and behavior
- B. Effects of Alcohol and drugs
- C. Impairment of driving ability
- D. Youth and driving
- E. Aging and driving

EXHIBIT 34—con't.

DRIVER LICENSE EXAMINING

VI. MOTOR VEHICLE LAW AND ADMINISTRATION
VII. POLICE TRAFFIC SERVICES AND LAW ENFORCEMENT
VIII. THE SCHOOLS AND DRIVER EDUCATION
IX. THE NATURE OF THE TRAFFIC ACCIDENT PROBLEM
X. DRIVER LICENSE RECORDS

BIBLIOGRAPHY

Curriculum/Instructional Materials

Many of the bibliographical entries are available in hard copy or microfiche through the Educational Resources Information Center (ERIC). Refer to Abstracts of Instructional Materials (AIM) and Abstracts of Research Materials (ARM), The Center for Vocational and Technical Education, The Ohio State University for additional information.

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MISSION OF THE CENTER

The Center for Vocational and Technical Education, an independent unit on The Ohio State University campus, operates under a grant from the National Center for Educational Research and Development, U.S. Office of Education. It serves a catalytic role in establishing consortia to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach and interinstitutional in its program.

The Center's mission is to strengthen the capacity of state educational systems to provide effective occupational education programs consistent with individual needs and manpower requirements by:

- Conducting research and development to fill voids in existing knowledge and to develop methods for applying knowledge.
- Programmatic focus on state leadership development, vocational teacher education, curriculum, vocational choice and adjustment.
- Stimulating and strengthening the capacity of other agencies and institutions to create durable solutions to significant problems.
- Providing a national information storage, retrieval and dissemination system for vocational and technical education through the affiliated ERIC Clearinghouse.